TESTING EQUIPMENT

FOR

ASPHALT · TAR ·
PETROLEUM PRODUCTS ·
CEMENT · CONCRETE ·
AGGREGATES · SUB-SOILS

INCLUDING

TESTING SIEVES
BALANCES AND WEIGHTS

CATALOG 15

HUMBOLDT MFG. CO.
2014 N. WHIPPLE STREET, CHICAGO 47, ILLINOIS

HUMBOLDT
TESTING EQUIPMENT
Catalog 15

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TERMS

Shipments are f. o. b. Chicago, unless otherwise quoted.

Payment of bills is required within 30 days from date of issue. We extend these terms to those who provide satisfactory credit references.

The payment for foreign shipments is made by draft with order or a banker's letter of credit payable on presentation of the invoice and shipping documents.

PACKING AND CASES

We make no extra charge to cover the cost of packing and cases for domestic shipments.

Export shipments require special packing and cases, and on such shipments we make an extra charge to cover the cost.

SHIPPING

Where specific shipping instructions are lacking, we use our judgment, which we base on the nature of the material, distance to be sent, and the size and weight of the package.

GUARANTEE

Each article is supplied with the guarantee that it will be of the best quality and workmanship and that it will be in accord with its description given in this catalog. However, we reserve the right to change any article in order to simplify or improve it, or should a change of standard specifications so require.

HUMBOLDT MFG. CO.

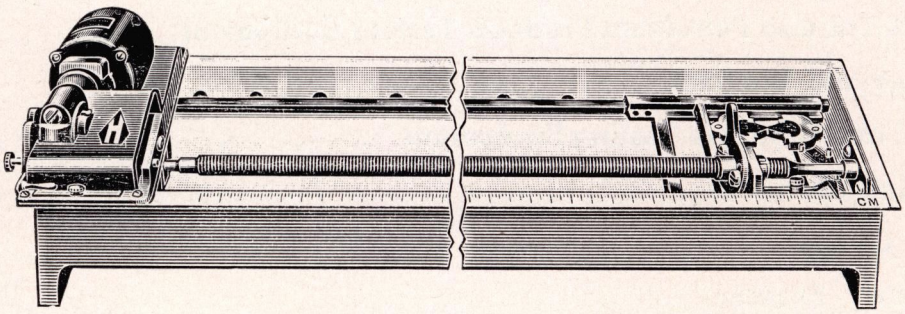
2014 NORTH WHIPPLE STREET

CHICAGO 47, ILL.

DUCTILITY TESTING MACHINES

Federal Specifications SS-R-406

A. S. T. M. Designation D113 **A. A. S. H. O. Method T-51**



104

104—DUCTILITY TESTING MACHINE, Humboldt, Direct Motor Driven, Improved Three-Speed Model, with a 150 cm. pull. With this machine, the ductility of an asphalt cement, or semi-solid bitumen is determined by measuring the distance to which it will elongate before breaking, when two ends of a standard briquet are pulled apart at a specific rate of speed and temperature.

Machine is made of a vitreous enameled cast iron trough. All gears are bronze and all other parts are made of brass to prevent rusting. The motor is synchronous and maintains a constant speed, driving the mechanism direct and entirely free from vibration. Speeds of ¼, 1 or 5 cm. per minute are selected by means of the lever on the side of the gear box. The single bronze lead screw is mounted above the water level to prevent agitation of the water. Three briquets can be tested simultaneously.

A pointer traveling with the carriage indicates the exact position of the carriage on a machine-cut linear centimeter scale attached to one side of the trough. The pointer is adjustable for zero setting. Maximum carriage travel is 150 cm. at which point it will stop automatically.

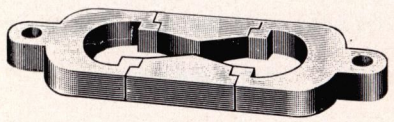
Furnished with 115 volt, 60 cycle, A. C. motor, cord and plug, and three No. 108 standard briquet molds with base plates.

Machines for other current, to order.

DUCTILITY MOLD

Federal Specifications SS-R-406

A. S. T. M. Designation D113 **A. A. S. H. O. Method T-51**



108

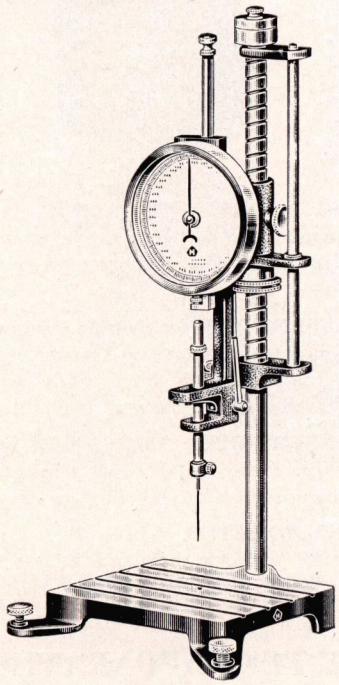
108—DUCTILITY MOLD. For making standard briquets for use with Ductility Testing Machine No. 104. The mold is accurately machined to specified dimensions. Similar parts of different molds are interchangeable and require no numbering or matching.

109—BRASS BASE PLATE, for use with No. 108 Ductility Mold.

"HUMBOLDT" UNIVERSAL PENETROMETER

Federal Specifications SS-R-406

A. S. T. M. Designation D5 **A. A. S. H. O. Method T-49**



123

THE STANDARD INSTRUMENT FOR PENETRATION MEASUREMENTS

UNIVERSAL APPLICATION

Being universal in application, the "Humboldt" Penetrometer can be used for penetration tests of bituminous materials, petrolatum, and greases, according to methods. For these tests either a standard asphalt penetration needle, a Roberts No. 2 needle, or standard grease penetration cone is used.

In brief, the penetrometer measures the depression in the sample, caused by a given force applied over a given area, and the average of such tests expressed in millimeters penetration is considered an index to "penetrability."

123—PENETROMETER, Humboldt, Universal. Latest improved form, for determining the consistency of asphalt cement or similar materials, by means of the penetration of a standard needle under standard conditions of time, temperature and load.

The dial is 5 in. in diameter, graduated into 400 divisions of 1/10 mm. corresponding to 40 mm. penetration.

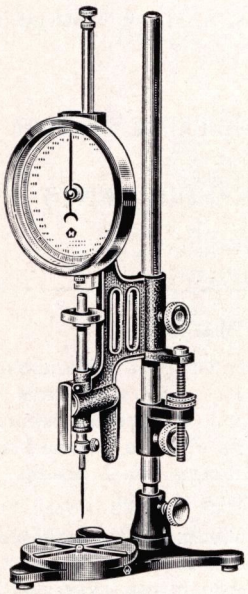
The combined weight of plunger and needle is 50 grams. Additional loading weights, one 50 gram and one 100 gram are supplied. Weights are mounted on top of the support rod when not in use.

In making the test of bituminous materials the needle plunger is loaded with the specified weight, the plunger raised upward to its stop and the screw below the dial adjusted to locate the dial needle at zero. The test box containing the sample is placed in the transfer dish filled with water from the water bath of sufficient depth to completely cover the sample. The transfer dish containing the sample is then placed upon the platform of the penetrometer. The set-screw, holding the penetrometer head, is then released and a few turns of the knurled nut downward will bring the needle point into exact contact with the surface of the sample. This may be best accomplished by making contact of the actual needle point with its image reflected by the surface of the sample from a properly placed source of light. The plunger is then released for the specified period of time. In moving downward the plunger is independent of the dial mechanism and does not actuate the dial hand. It is thus free from friction or drag and so, very accurate. Depth of penetration is measured by depressing the button above the dial which deflects the needle to the limit of displacement that has been made by the plunger. A special automatic release prevents accidental release or "after stop" slippage.

To return the dial needle to zero after completing the first test, the plunger is merely raised as before. If the initial setting is accurate, the dial needle will always return exactly to zero and reading will check against standard gauge blocks.

Furnished with two No. 128 Standard Needles.

PENETROMETER *(Continued)* AND ACCESSORIES



125

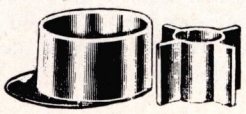
128-130

125—PENETROMETER, Humboldt, Miniature—Portable Type. Similar to No. 123, but smaller and lighter for field work. The weight of needle bar with needle is 50 grams and in addition a 50-gram weight is furnished.

128—PENETROMETER NEEDLE, A. S. T. M. D-5, with shank for use with Nos. 123 and 125 Penetrometers.

130—PENETROMETER NEEDLE. Like No. 128, but certified for accuracy by the U. S. Bureau of Standards.

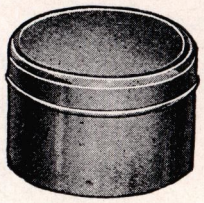
NOTE—Above Penetration Needles are furnished with shanks. If needles without the shanks are wanted, please specify so when ordering. Certified needles in all cases are furnished with the shanks which carry a mark of identification as indicated on the certificate. If these are desired without the shanks, needles are easily pulled out of the shanks.



134

134—PENETROMETER TEST BOX. Holds 5 samples for penetration testing. Made of brass, consisting of a base plate, cylinder and snug-fitting insert which forms 5 sample receptacles. Inside diameter 2 in., height 1¼ in.

PENETROMETER ACCESSORIES *(Continued)*



135

135—ASPHALT SAMPLE CONTAINER, A. S. T. M., for use in penetration test and evaporation test A. S. T. M. D6. Capacity 3 ounces. Diameter 55 mm., height 35 mm.

135-1—TRANSFER DISH for Sample Container. Heavy glass. The sample container is transferred from the water bath into the dish filled with water of the bath onto the base of the Penetrometer for test.

135-2—TRANSFER DISH. Like No. 135-1, but larger and fitted with three metal cleats cemented in with waterproof composition for levelling container.

T135-3—THERMOMETER. Three Test Points at 32, 77 and 115° F. for Ductility and Penetration Baths, 0.2° division, length 8 in., Red Reading Mercury.

FLOAT TEST APPARATUS FOR BITUMINOUS MATERIALS

A. S. T. M. Designation D139
A. A. S. H. O. Method T-50
Federal Specifications SS-R-406

140

140—ASPHALT VISCOSIMETER, A. S. T. M. For determining the consistency of bituminous materials. Consists of an aluminum float and three brass collars.

141—FLOAT only, for No. 140.

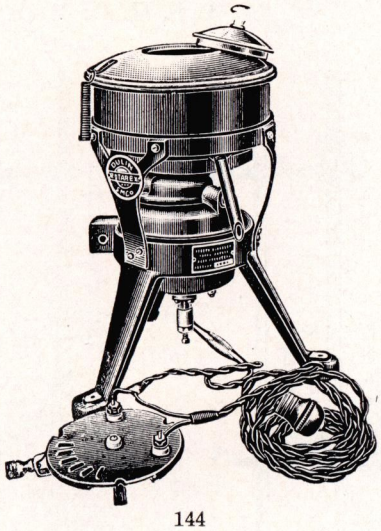
142—COLLAR only, for No. 140.

T143-C—THERMOMETER, A. S. T. M. Low Softening Point; minus 2 to plus 80 deg. C.; 1/5 deg. divisions; length 15 in.

T143-F—THERMOMETER, A. S. T. M. Low Softening Point; 30 to 180 deg. F.; ½ deg. divisions; length 15 in.

EXTRACTION OF BITUMINOUS AGGREGATES

A. A. S. H. O. Method T-58



144

144—CENTRIFUGAL EXTRACTOR, Dulin Rotarex, No. 1 motor driven, capacity 100 grams, for the extraction of bituminous aggregates. Will give complete extraction in 10 minutes. Consists essentially of a 110-volt Universal motor which can be operated on D.C. or 60-cycle A.C. and is directly connected to the aluminum extraction bowl. The bowl is surrounded by a cylindrical aluminum shell, shaped to drain through a spout at the side. The solvent is introduced into the extraction bowl through the funnel shaped screw which holds the filter ring and cover in place. The outer cover is made in two pieces so that the section immediately over the funnel may be removed when the solvent is added. Complete with rheostat, cord with plug for attaching to lamp socket, and directions for operating.

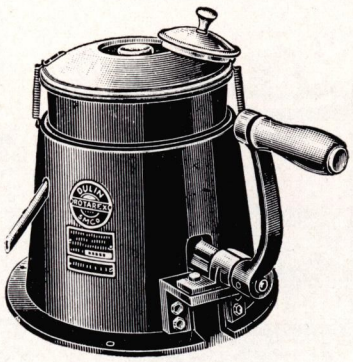
145—CENTRIFUGAL EXTRACTOR, Dulin Rotarex, No. 2, motor driven, capacity 1,000 grams. Improved Model. This apparatus has been completely redesigned and now uses a variable speed, explosion-proof motor. A brake has been added for bringing the separator quickly to a stop at the completion of a test. The entire machine is mounted on vibration-absorbing cushions.

For operation on A.C. a variable auto-transformer for controlling the speed is provided and D. C. models are equipped with a rheostat.

A, for 110 v. 50-60 cycle A.C., with auto-transformer.
B, for 110 v. D.C., with rheostat.
C, for 220 v. 50-60 cycle A.C., with auto-transformer.
D, for 220 v. D.C., with rheostat.

EXTRACTORS

(Continued)



146

146—CENTRIFUGAL EXTRACTOR, Dulin Rotarex, hand driven, capacity 100 grams, designed for field use. Built on the same principle as the motor-driven extractor No. 144. Supplied with directions for operating.

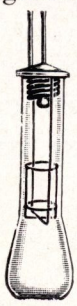
147—CENTRIFUGAL EXTRACTOR, Dulin Rotarex, hand driven, capacity 500 grams, designed for field use. Supplied with directions for operating.

148—FILTER PAPER RINGS, for use with Dulin Rotarex Extractors.

For Extractor, 100, 500 and 1,000 grams capacity. (Specify Which)

INSOLUBLE MATTER IN CREOSOTE

A. S. T. M. Designation: D38; D367



181

181—EXTRACTION APPARATUS. For the determination of matter insoluble in benzol in the analysis of creosote oil, as specified. Consists of condenser, wire basket and Pyrex flask.

182—CONDENSER only, for No. 181.

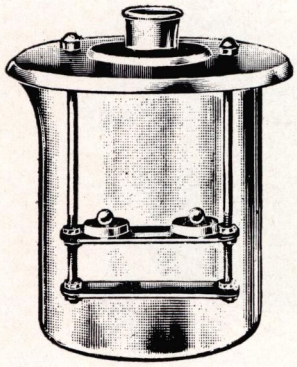
184—WIRE BASKET only, for No. 181.

SOFTENING POINT OF BITUMINOUS MATERIALS

Ring and Ball Method

Federal Specifications SS-R-406

A. S. T. M. Designation D36; E28 **A. A. S. H. O. Method T-53**



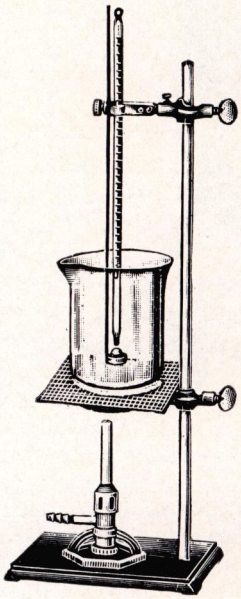
156

157

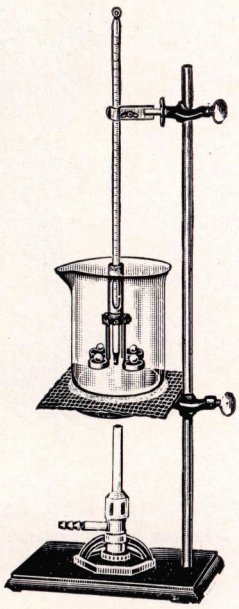
158-1

898

895



159



162

156—SOFTENING POINT APPARATUS. Shelf type, for determining the softening point of bituminous materials, other than tar products. Apparatus consists of 2 standard balls; 2 standard rings; 600 ml. Pyrex beaker; support for rings and cover with opening for thermometer.

157—RING only, for No. 156.

158—STEEL BALLS only, for Nos. 156, 159, 162 and 163.

158-1—BALL CENTERING GUIDE. A. S. T. M. E28.

159—SOFTENING POINT APPARATUS. Single unit, complete as illustrated, with Tirrill type burner and glassware.

160—RING AND STEM only, for No. 159.

162—SOFTENING POINT APPARATUS. Four unit, for making four determinations. The support for the four rings and balls is designed for suspension from the thermometer. Complete with A. S. T. M. thermometer.

163—SOFTENING POINT APPARATUS. Same as No. 162, but six unit, for making six determinations.

164—FOUR-UNIT RING CLUSTER only, for No. 162.

165—SIX-UNIT RING CLUSTER only, for No. 163.

156-S—SOFTENING POINT APPARATUS. Like No. 156, but with shouldered rings. A.S.T.M. E28.

157-S—SHOULDERED HOLE RINGS only.

158-1X—BALL CENTERING GUIDE, for shouldered rings, A.S.T.M. E28.

159-S—SOFTENING POINT APPARATUS. Like No. 159, but with shouldered rings.

162-S—SOFTENING POINT APPARATUS. Like No. 162, but with shouldered rings.

898—THERMOMETER CLAMP only, for No. 159.

895—THERMOMETER CLAMP only, for Nos. 162, 163 and 166.

T143-C—THERMOMETER, A. S. T. M. Low Softening Point; minus 2 to plus 80 deg. C.; 1/5 deg. divisions; length 381 mm.

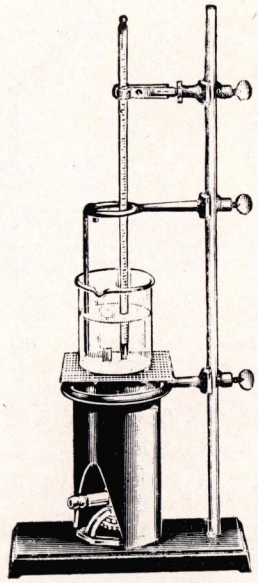
T143-F—THERMOMETER, A. S. T. M. Low Softening Point; 30 to 180 deg. F.; ½ deg. divisions; length 15 in.

T161-C—THERMOMETER, A. S. T. M. High Softening Point; 30 to 200 deg. C.; ½ deg. div.; length 381 mm.

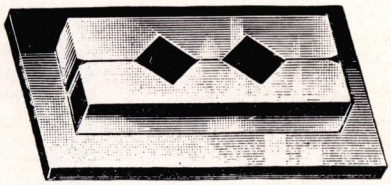
T161-F—THERMOMETER, A. S. T. M. High Softening Point; 85 to 392 deg. F.; 1 deg. divisions; length 15 in.

SOFTENING POINT OF TAR PRODUCTS

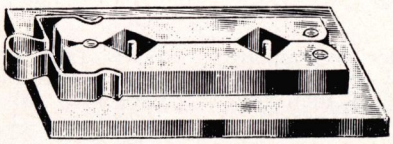
A. S. T. M. Method D61



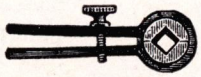
166



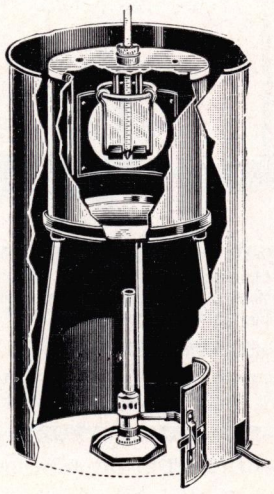
168



170



172



167

166—SOFTENING POINT APPARATUS, Cube in Water Method. For the determination of the melting point of pitches melting below 80 degrees Centigrade (176 deg. F.)

167—MELTING POINT AIR OVEN, Cube in Air Method. For determining the melting point of pitches melting above 77 deg. C. (170 deg. F.). The oven is made of copper in cylindrical form. It has mica covered peep holes on opposite sides. The cover, having a tubulature for thermometers, is removable and is furnished with a circular wire rail on the under side to carry the suspension hooks. There is a removable false bottom equipped with two long handles. Four suspension hooks are supplied. This assembly is supported on a special tripod. A cylindrical shield equipped with corresponding peep holes and door for introducing the burner surrounds the entire apparatus.

168—PITCH MOLD, for Softening Point Test and Specific Gravity of Asphalt and Tar Pitches. For making two ½-in. cubes of pitch or other bituminous materials as described in Bulletin No. 314 of the United States Bureau of Public Roads. With base plate.

170—PITCH MOLD, for Softening Point Test. Similar to above but improved, for making two ½-in. cubes with holes in center. With clamp and base plate.

172—PITCH MOLD. Made of brass with iron clamp; for ½-in. cubes.

T143-C—THERMOMETER, A. S. T. M. Low Softening Point; minus 2 to plus 80 deg. C.; 1/5 deg. div.; length 381 mm.

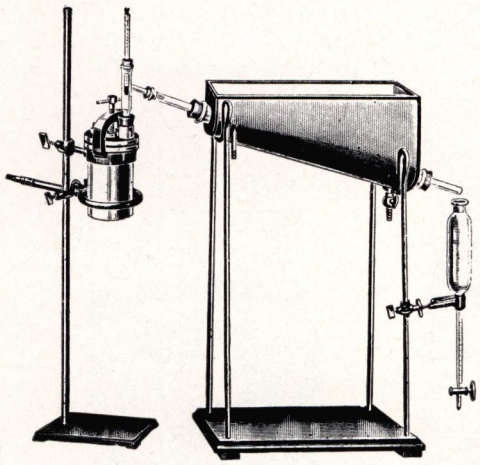
T143-F—THERMOMETER, A. S. T. M. Low Softening Point; 30 to 180 deg. F.; ½ deg. div.; length 15 in.

T161-C—THERMOMETER, A. S. T. M. High Softening Point; 30 to 200 deg. C.; ½ deg. div.; length 381 mm.

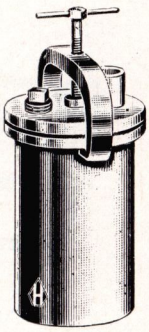
T161-F—THERMOMETER, A. S. T. M. High Softening Point; 85 to 392 deg. F.; 1 deg. div.; length 15 in.

WATER IN CREOSOTE

A. S. T. M. Designation D38; D370 **A. A. S. H. O. Method T-83**



185



187-2
187-5

187-3
187-6

185—DEHYDRATING APPARATUS, for determining the percentage of water in creosote and creosote coal-tar solution in preparation for the distillation test. Complete as illustrated.

187-1—CONDENSER TROUGH on support, for above.

187-2—TAR STILL. Copper, 3½x6 in. for above. Capacity 1 qt.

187-3—TAR STILL SUPPORT only, for above.

187-4—RING BURNER only, for above.

187-5—TAR STILL, Copper. Same as No. 187-2, but larger. Diameter, inside 5 in.; height, inside 7½ in. Capacity 1 gal.

187-6—TAR STILL SUPPORT, for No. 187-5.

187-7—RING BURNER, for No. 187-5.

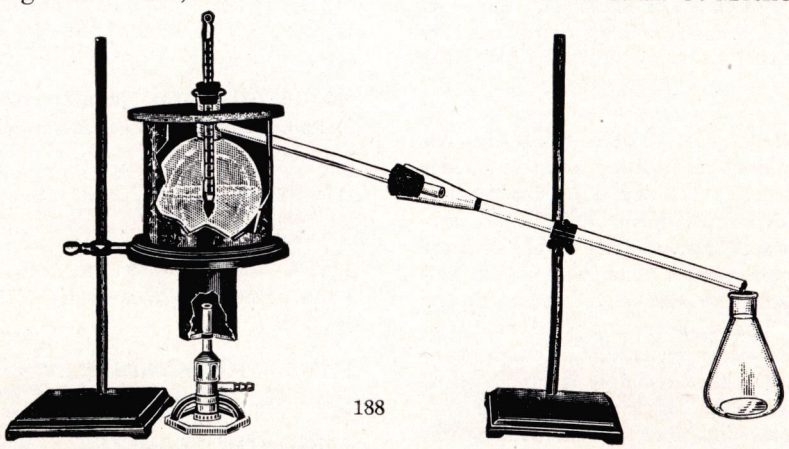
T187-C—THERMOMETER, A. S. T. M. High Distillation; 0 to 400 deg. C.; 1 deg. divisions; length 381 mm.

T187-F—THERMOMETER, A. S. T. M. High Distillation; 30 to 760 deg. F.; 2 deg. divisions; length 15 in.

DISTILLATION OF BITUMINOUS MATERIALS SUITABLE FOR ROAD TREATMENT AND CREOSOTE OIL

Federal Specifications SS-R-406

A. S. T. M. Designation D20; D246 **A. A. S. H. O. Methods T-52; T-62**



188

188—DISTILLATION APPARATUS. For the distillations of creosote and mixtures of creosote with tars and oils used for timber preservation, and for bituminous materials suitable for road treatment. Complete as illustrated.

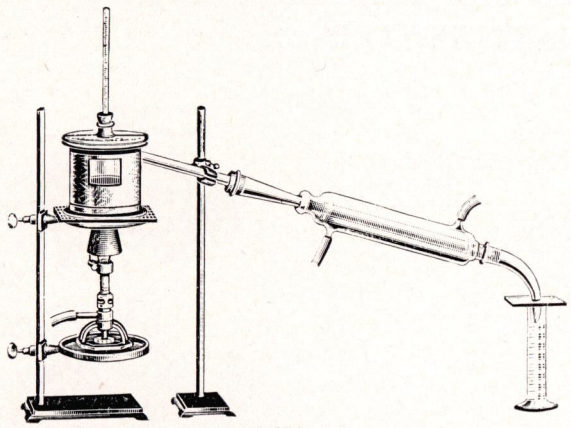
193—DISTILLATION SHIELD only, for above, with mica windows.

THERMOMETERS, for No. 188, see Nos. T187-C and T187-F above.

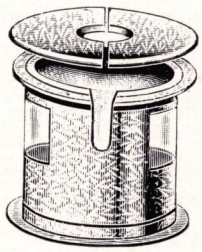
SEPARATION OF LIQUID ASPHALTIC PRODUCTS

Federal Specifications SS-R-406

A. S. T. M. Designation D402 **A. A. S. H. O. Method T-78**



191



193

191—DISTILLATION APPARATUS, for the separation of the volatile and non-volatile portions of cut-back asphaltic products. Complete as illustrated.

193—DISTILLATION SHIELD only, for above, with mica windows.

T187-C—THERMOMETER, A. S. T. M. High Distillation; 0 to 400 deg. C.; 1 deg. divisions; length 381 in.

T187-F—THERMOMETER, A. S. T. M. High Distillation; 30 to 760 deg. F.; 2 deg. divisions; length 15 in.

FLASH POINT BY THE TAG CLOSED TESTER

Federal Specifications 110.11

A. S. T. M. D-56 **A. A. S. H. O. Method T-79**

The Tag Closed Tester is for measuring the flash point of all volatile flammable liquids, except fuel oils, flashing below 175 deg. F. (80 deg. C.).

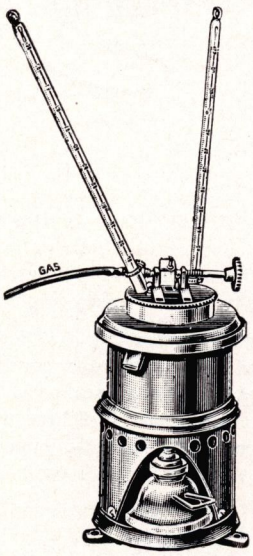
The instrument consists of an oil cup surrounded by a water bath, with a test flame exposure device mounted on the cover. The test flame is introduced into the oil cup by turning a knob on the cover.

198—TAG CLOSED TESTER. Complete with alcohol burner and two thermometers, either Cent. or Fahr., as ordered. See Catalog Nos. T198-1C and T198-2F.

198-1—TAG CLOSED TESTER. As above, but with gas burner. (Specify kind of gas).

T198-1C—THERMOMETER, A. S. T. M. P. M., and TAG. Low Range; minus 7 to plus 110 deg. C.; ½ deg. div.; length 10⅞ in.

T198-2F—THERMOMETER, A. S. T. M. P. M. and Tag. Low Range; 20 to 230 deg. F.; 1 deg. div.; length 10⅞ in.

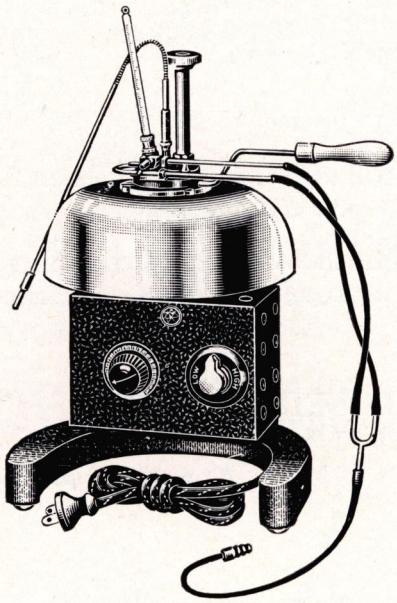


198

FLASH POINT BY THE PENSKY-MARTENS CLOSED TESTER

A. S. T. M. Designation D93 **A. A. S. H. O. Method T-73**

Federal Specifications 110.22



195

The Pensky-Martens Tester is specified by the A.S.T.M., A.A.S.H.O. and U. S. Government for determining the flash point of fuel oils, both light and heavy, cut-back asphalts and other viscous materials.

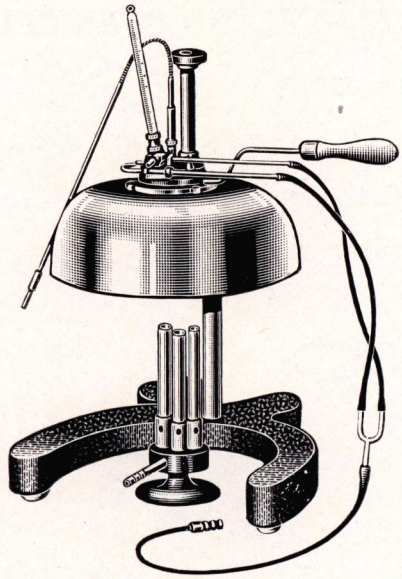
195—ELECTRIC MODEL (Gas Ignition). Strictly in accordance with the specifications. The heating unit is clamped tightly all around the air-bath to give maximum efficiency and is easily replaced.

The rheostat with indicating dial and three heat switch is mounted in a ventilated control box under the air-bath, making a compact unit. A pilot light mounted in the control box indicates while the current is on. The cover and operating mechanism is of black instrument finish, top plate (or bell) of polished brass. Air-bath and supporting rod are nickel plated, control box and base black crystalline finish. The six feet conductor has a separable plug. Regularly furnished for 110 Volts 60 Cycles A.C.; furnished for 220 Volts on special order.

A wooden carrying case with compartments for thermometers is part of the equipment. Alcohol ignition in place of gas is also available upon request.

Complete as illustrated but without thermometers.

FLASH POINT BY THE PENSKY-MARTENS CLOSED TESTER (Continued)



197

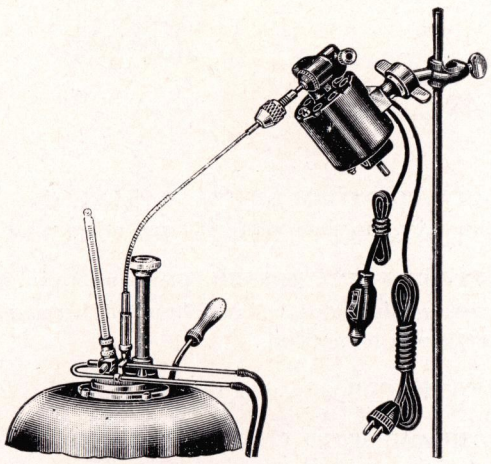
197—GAS MODEL. The air-bath and bell are supported on a sturdy base giving a low center of gravity to the apparatus and ample room to adjust burner, as they are supported on a ¾ inch steel bar, leaving the entire front open.

The cover and operating mechanism is of black instrument finish, top plate (or bell) of polished brass. Air-bath and supporting rod are nickel plated. The base has a black crystalline finish.

A high temperature Meker type gas burner is used for heating.

The hardwood carrying case with thermometer compartments and Meker type gas burner are standard equipment.

Complete as illustrated but without thermometers.



197-1

197-1—MOTOR STIRRER FOR PENSKY-MARTENS CLOSED FLASH POINT TESTER.

This stirrer conforms in speed to the specifications. It can be used for both tests, for fuel oils where the speed of stirring is between 60 to 120 revolutions per minute and for cut-back asphalt where stirring must be maintained between 70 to 80 revolutions per minute.

The stirrer is clamped on to any laboratory stand, the end of the flexible stirring rod is clamped into the universal chuck, which is a part of the stirrer. No dismantling of any part is necessary. The angle of the stirring rod can be adjusted by means of the ball-joint socket attached to the motor stirrer. Speed is maintained constant at 78 revolutions per minute.

The cord and plug and "On and Off" switch are arranged so that starting and stopping of stirring can be accomplished by the operator next to the apparatus.

Regularly furnished for 110 Volts; 60 Cycles A.C.; furnished for 220 Volts on special order.

T198-1C—THERMOMETER, A.S.T.M. P.M. and TAG. Low Range; minus 7 to plus 110 deg. C.; ½ deg. div.; length 275 mm.

T198-2F—THERMOMETER, A.S.T.M. P.M. and TAG. Low Range; 20 to 230 deg. F.; 1 deg. div.; length 10⅞ in.

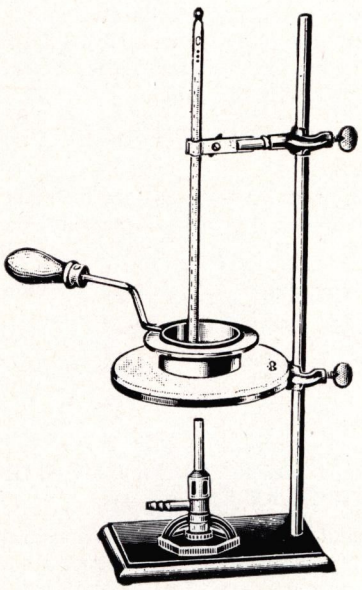
T197-2C—THERMOMETER, A.S.T.M. P.M. High Range; 90 to 370 deg. C.; 2 deg. div.; length 275 mm.

T197-3F—THERMOMETER, A.S.T.M. P.M. High Range; 200 to 700 deg., F.; 5 deg. div.; length 10⅞ in.

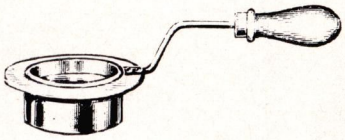
FLASH AND FIRE POINT TEST BY THE CLEVELAND OPEN CUP

Federal Specifications SS-R-406; 110.33

A. S. T. M. D-92 **A. A. S. H. O. Method T-48**

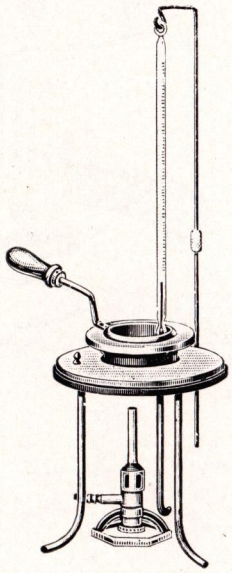


200



206

895



203

This method of test is intended for determining the flash and fire points of all petroleum products except fuel oils and those having an open cup flash below 175 F. (79 C.).

The flash cup is made of hard brass, carefully machined to A. S. T. M. standard dimensions and equipped with a handle sufficiently extended to prevent overheating. The cast iron circular plate and asbestos top in which the flash cup rests, comply with A. S. T. M. specifications.

The gas burners are the adjustable Tirrill type and are supplied specifically for the kind of gas used (Specify gas you use when ordering).

200—FLASH POINT TESTER, Cleveland Open Cup. Complete as illustrated, with a Fahrenheit thermometer or Centigrade if specified.

202—CUP PLATFORM only, for above. Consists of a cast iron circular plate with muff and asbestos top.

203—FLASH POINT TESTER, Cleveland Open Cup. Complete as illustrated, with a Fahrenheit thermometer or Centigrade if specified.

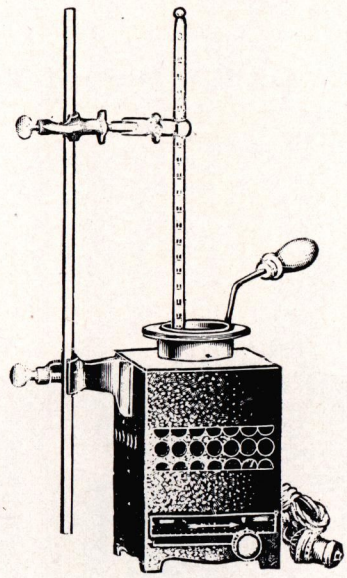
206—FLASH CUP only, with handle.

895—THERMOMETER CLAMP only, for Nos. 200 and 208.

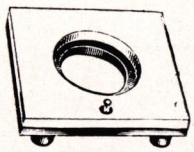
T205-F—THERMOMETER, A. S. T. M. Cleveland Open Cup Flash; 20 to 760 F.; 5 deg. divisions; length 12 in.

T205-C—THERMOMETER, A. S. T. M. Cleveland Open Cup Flash; minus 6 to plus 400 C.; 2 deg. divisions; length 12 in.

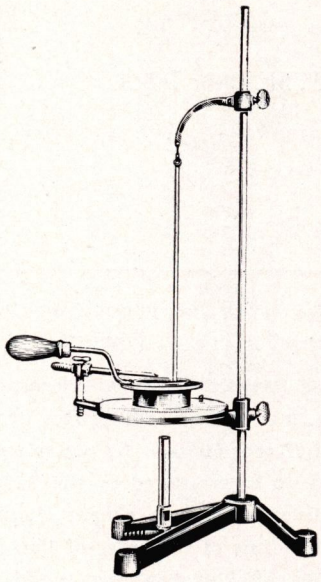
FLASH POINT TESTERS (Cont'd)



208



208-1



210

208—FLASH POINT TESTER, Cleveland Open Cup, Electric Model. Complete with a 550-watt electric rheostat heater with cord and plug; support rod, thermometer clamp and Fahrenheit thermometer or Centigrade if specified.

Specify 110 or 220 volts.

208-1—CUP PLATFORM only, for No. 208.

210—FLASH POINT TESTER, Cleveland Open Cup. Improved form. With special horizontal flash burner and a special thermometer holder for lifting thermometer out of cup. Complete with a Tirrill type burner and Fahrenheit thermometer or Centigrade if specified.

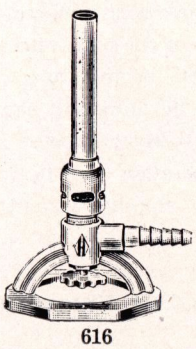
Specify kind of gas used.

210-1—CUP PLATFORM only, for No. 210, cast iron, with support muff, test flame bead and sleeve for reception of test-flame burner.

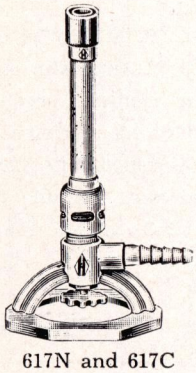
210-2—ASBESTOS DISC only, for No. 210.

210-3—TEST-FLAME BURNER only, for No. 210.

210-4—THERMOMETER SUSPENSION HOOK only, for No. 210.



616



617N and 617C

616—TIRRILL TYPE BURNER. Heavy cast base of noncorrodible alloy, ½ in. diameter brass tube and needle valve control with leak-proof packing gland. For use on artificial and mixed natural gas. Height 6 in.

617N—TIRRILL TYPE BURNER. Like No. 616, but with patented flame stabilizer attachment for use on straight natural gas.

617C—TIRRILL TYPE BURNER. Like No. 617N, but for use on cylinder gases such as butane, propane, pyrofax, etc.

SAYBOLT VISCOSIMETER

A. S. T. M. D88; D244 **A. A. S. H. O. Method T-72; T-59**

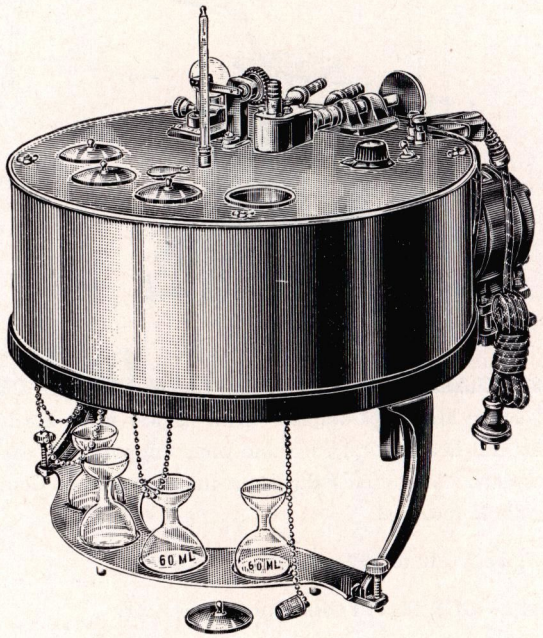
Federal Specifications SS-R-406; 30.43

This test is for determining the Saybolt viscosity of petroleum products and lubricants.

The Saybolt Universal Viscosimeter shall be used only for oils with times of flow of more than 32 sec. There is no maximum limit to viscosity to be measured by the Saybolt Universal Viscosimeter but, in general, liquids having an outflow time of the order of 1000 sec. and higher, Saybolt Universal, are tested more conveniently by means of the Saybolt Furol Viscosimeter.

The Saybolt Furol Viscosimeter shall be used only for oils with times of flow of more than 25 sec. The outflow time of the Furol instrument is about one-tenth that of the Universal.

The two-tube bath can be used with one or two tubes; the four-tube bath is for any number of tubes up to four.

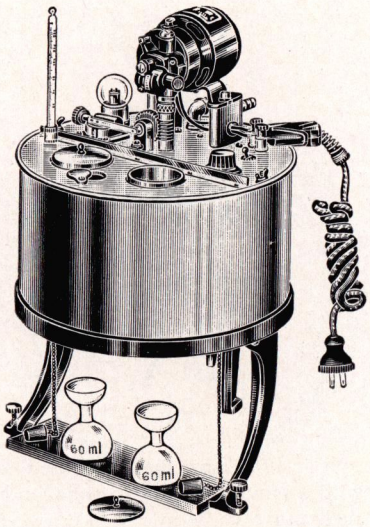


215

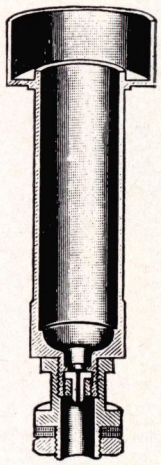
215—VISCOSIMETER, Saybolt, Thermostatically Controlled. Four Tube Capacity. With motor stirrer and automatic temperature control, for the determination of the viscosity of both light and heavy oils according to **A. S. T. M. Standards,** and **A. A. S. H. O. Methods.** The bath is provided with powerful heating units which will raise the temperature from that of the room to 212 deg. F. in less than 15 minutes. Temperature control is accomplished by a sensitive thermo-regulator and an improved relay, which will hold the temperature within plus or minus 0.1 deg. F. at any point from room temperature to 225 deg. F. Apparatus consists of the bath with stirrer, heating elements, cooling coil, temperature control and guide for receiving flasks but does not include oil tubes, thermometers, flasks, stopwatch, pipette, strainer and pan. Suitable for operation on 110 volts 60 cycles A.C. or 110 volts D.C. Specify current when ordering.

One, Three, Five and Six-Tube Viscosimeters to order.

SAYBOLT VISCOSIMETERS (Continued)

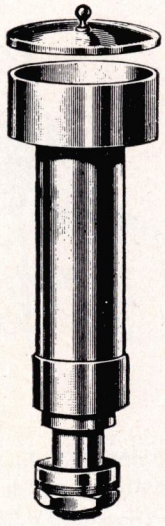


216



217-1,

217-2



216—VISCOSIMETER, Saybolt. Same as No. 215, but two tube capacity.

217-1—VISCOSIMETER TUBE, with one **Universal Orifice,** for use with Nos. 215 and 216 Saybolt Viscosimeters for the determination of the viscosity of lubricants and light oils.

217-2—VISCOSIMETER TUBE, with one **Furol Orifice,** for use with Nos. 215 and 216 Saybolt Viscosimeters for the determination of the viscosity of fuel oils and other heavy oils.

217-3—UNIVERSAL ORIFICE only, stainless steel.

217-4—FUROL ORIFICE only, stainless steel.

217-6—RECEIVING FLASK, Pyrex, 60 ml.

217-7—PIPETTE.

217-8—STRAINER, 100 mesh.

217-9—PAN WITH LIP.

217-10—TUBE CLEANER.

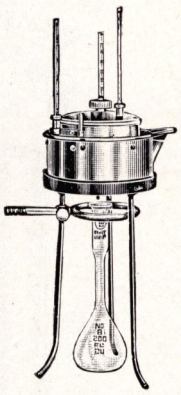
SAYBOLT VISCOSITY THERMOMETER

Cat. No.	Temperature Range	Subdivisions
Fahrenheit Thermometers		
T217-F1	66 to 80 F.	0.2 F.
T217-F2	94 to 108 F.	0.2 F.
T217-F3	120 to 134 F.	0.2 F.
T217-F4	134 to 148 F.	0.2 F.
T217-F5	174 to 188 F.	0.2 F.
T217-F6	204 to 218 F.	0.2 F.
Centigrade Thermometers		
T217-C1	19 to 27 C.	0.1 C.
T217-C2	34 to 42 C.	0.1 C.
T217-C3	49 to 57 C.	0.1 C.
T217-C4	57 to 65 C.	0.1 C.
T217-C5	79 to 87 C.	0.1 C.
T217-C6	95 to 103 C.	0.1 C.

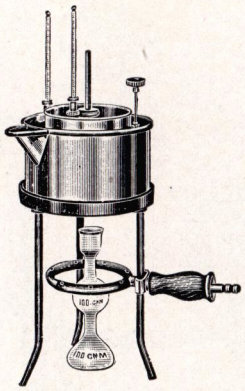
ENGLER VISCOSIMETERS

Federal Specifications 34

A. S. T. M. Designation D490 **A. A. S. H. O. Method T-54**



220



222

220—VISCOSIMETER, Engler; for determining the viscosities of both low and high viscosity oils, bituminous substances, etc., as described in U. S. Dept. of Agriculture Bulletin No. 1216. Complete, including gold-plated oil cup and cover with platinum orifice, water bath, tripod, burner, flask and any two of the following thermometers: ranges 10 to 50 C. or 10 to 150 C.

T221-1C—THERMOMETER, Engler Viscosity, with brass ferrule; 10 to 50 C.; 1 deg. divisions; length 230 mm.

T221-2C—THERMOMETER, Engler Viscosity, with brass ferrule; 10 to 150 C.; 1 deg. divisions; length 260 mm.

221-3—FLASK only, for No. 220 Engler Viscosimeter. Capacity 200 ml.

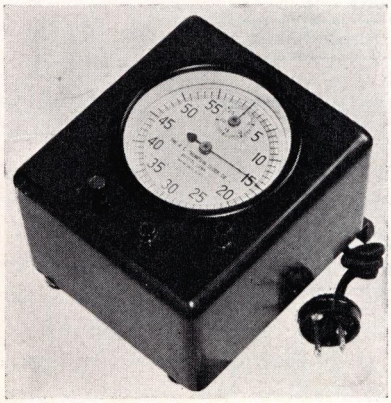
222—VISCOSIMETER, Engler-Ubbelohde. This differs from the preceding in that the oil cup is totally immersed, the bath is somewhat larger, the lid of the oil cup is double walled and insulated, and the bath is equipped with a hand stirrer, as recommended in U. S. Dept. of Agriculture Bulletin No. 949, and A. S. T. M. D490. Complete as illustrated with flask and one each A. S. T. M. Engler Thermometers, ranges 18 to 28 C., 39 to 54 C. and 95 to 105 C.

T222-1C—THERMOMETER, Engler-Ubbelohde Viscosity, with brass ferrule; 18 to 28 C.; 0.2 deg. divisions; length 8 in.

T222-2C—THERMOMETER, Engler-Ubbelohde Viscosity, with brass ferrule; 39 to 54 C.; 0.2 deg. divisions; length 10 in.

T222-3C—THERMOMETER, Engler-Ubbelohde Viscosity, with brass ferrule 95 to 105 C.; 0.2 deg. divisions; length 8 in.

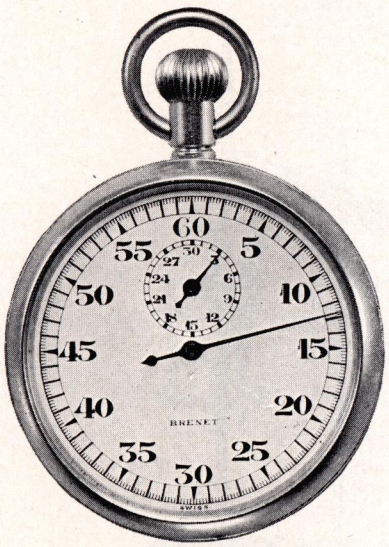
222-4—FLASK only, for No. 222 Engler-Ubbelohde Viscosimeter. Capacity 200 ml. with two 100 ml. bulbs.



225

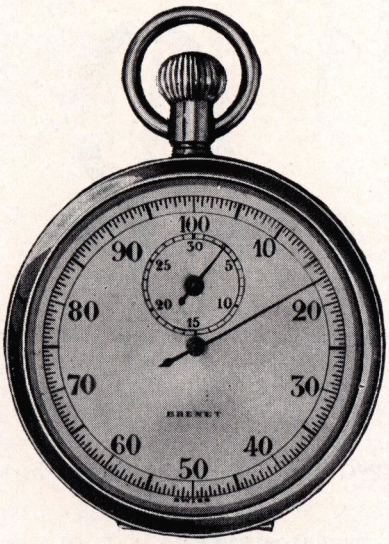
225—STOP CLOCK, Electric. With 3 inch dial divided into 60 seconds, each second sub-divided into fifths, small dial divided into 30 minutes. For use with penetrometers, viscosimeters, and for timing other laboratory operations with start, stop and throw back features. Motor is started and stopped instantaneously by a switch and mechanical brake. Accurate to within 1/5 second for any time interval. Furnished in dull finish mahogany case with 6 ft. of connecting cord and plug, for 110 volt, 60 cycle, A. C.

STOPWATCHES



226-1

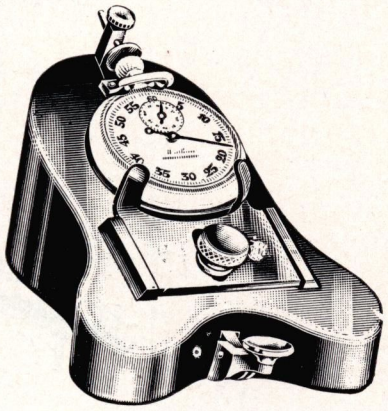
226-1—STOPWATCH, 1/5 seconds, 60-second dial, 30-minute register, for use with penetrometers, viscosimeters, and for timing other laboratory operations. Start, stop, and return to zero by successive depressions of the crown. The case is made of nickel, chromium finished, with a double back to make it dustproof. Seven-jewel, antimagnetic movement.



226-2

226-2—STOPWATCH, full and half seconds, 100-second dial, with register indicating to 30 revolutions or 3,000 seconds. Otherwise like No. 226-1.

STOPWATCH SUPPORT

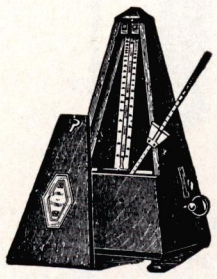


227

227—STOPWATCH SUPPORT. The watch is held at an angle against a felt pad and is easily inserted and removed. Pressure on the watch stem is effected by a plunger with an adjustable stop to accommodate various stem movements—to eliminate "hammering." Remote control may be accomplished by simply leading a string or wire to the plunger. Support is heavy and will not tip over. Watch is always in position for reading and manipulation. Accidental control is eliminated because the watch does not remain in the operator's hands.

Protects the watch from breakage, dirt, abuse, misplacement.

METRONOME



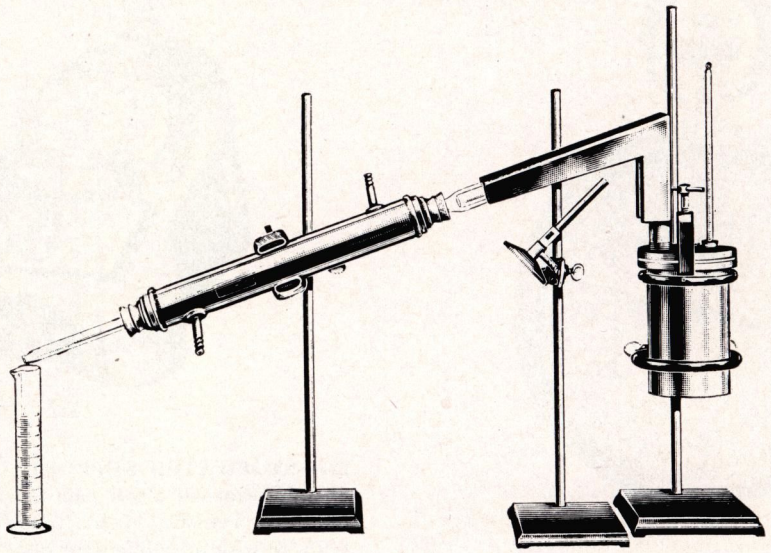
228

228—METRONOME. For use with penetrometers, viscosimeters, and for timing other laboratory operations in place of stopwatch.

DISTILLATION OF EMULSIFIED ASPHALT

A. S. T. M. Designation D244 **A. A. S. H. O. Method T-59**

Federal Specifications SS-R-406

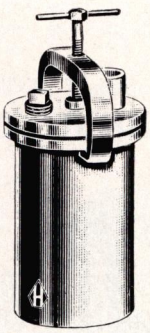


229

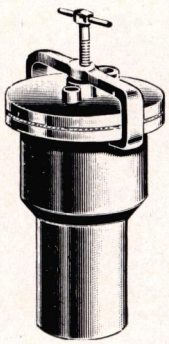
This method is intended for the examination of asphalt emulsions composed principally of a semi-solid or liquid asphaltic base, water, and an emulsifying agent.

229—DISTILLATION APPARATUS. Complete with iron still No. 235, still support, adjustable ring gas burner, connecting tube, tin shield, brass condenser jacket with Pyrex condenser tube, Fahrenheit thermometer and other accessories as illustrated.

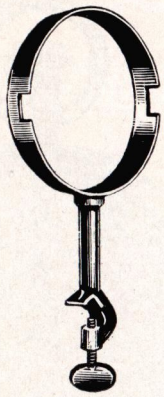
231—DISTILLATION APPARATUS for Badly Foaming Emulsions. As above, but with a modified iron still No. 236, still support and additional ring burners.



235



236



187-3/187-6

235—IRON STILL only, for No. 229.

187-3—STILL SUPPORT only, for above.

187-4—RING BURNER only, for above.

236—IRON STILL only, modified for badly foaming emulsions, for No. 231.

187-6—STILL SUPPORT only, for above.

236-1—RING BURNERS only. Set of three for still No. 236.

T236-F—THERMOMETER, A. S. T. M. Low Distillation; 30 to 580 F.; 2 deg. divisions; length 15 in.

T236-C—THERMOMETER, A. S. T. M. Low Distillation; 0 to 300 C.; 1 deg. divisions; length 15 in.

DISTILLATION APPARATUS

For following A. S. T. M. Tests:

D13—Spirits of Turpentine.

D86 —Gasoline, Naphtha, Kerosene.

D158—Gas Oils.

D216—Natural Gas Gasoline.

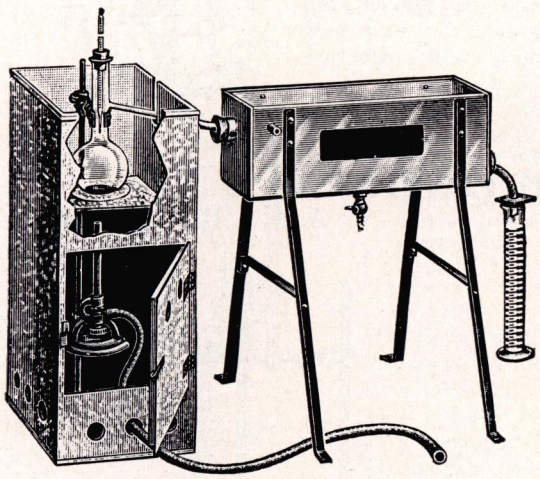
D233—Turpentine.

D285—Crude Petroleum.

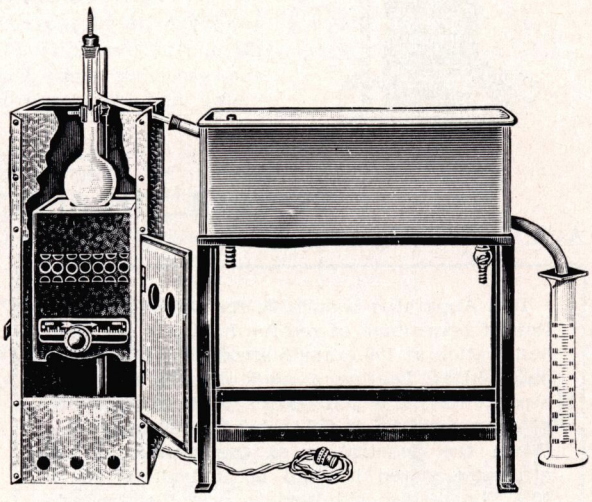
D396—Fuel Oils.

D447—Plant Spray Oils.

Federal Specifications SS-R-406; 25; 100.14.



237



239

237—DISTILLATION APPARATUS, Gas Heated. Complete as illustrated, with Fahrenheit thermometers or Centigrade if ordered, and with accessories to conform to the individual requirements for each of the above tests. (Please specify product to be tested and kind of gas used.)

239—DISTILLATION APPARATUS, Electrically Heated. Like No. 237, but with a 550-watt electric rheostat heater. Specify voltage.

241—CONDENSER TROUGH on support only.

242—DISTILLATION SHIELD only.

T236-F—THERMOMETER, A. S. T. M. Low Distillation; 30 to 580 F.; 2 deg. divisions; length 15 in.

T236-C—THERMOMETER, A. S. T. M. Low Distillation; 0 to 300 C.; 1 deg. divisions; length 15 in.

T187-F—THERMOMETER, A. S. T. M. High Distillation; 30 to 760 F.; 2 deg. divisions; length 15 in.

T187-C—THERMOMETER, A. S. T. M. High Distillation; 0 to 400 C.; 1 deg. divisions; length 15 in.

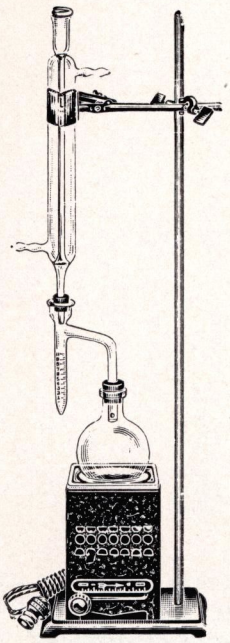
T240-C—THERMOMETER, A. S. T. M. Turpentine Distillation; 147 to 182 C.; 0.2 deg. divisions.

Triple-Unit Distillation Apparatus made to order.

WATER IN PETROLEUM PRODUCTS AND OTHER BITUMINOUS MATERIALS

A. S. T. M. Designation D95; D244 **A. A. S. H. O. Method T-55**

Federal Specifications SS-R-406; 300.13



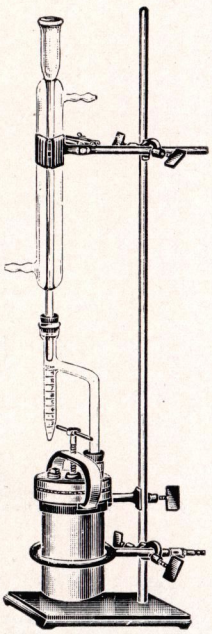
243

Apparatus is for the determination of water in petroleum products or bituminous materials by distilling with a volatile solvent.

This method is suitable for a variety of materials, but is especially applicable to petroleum, fuel oil, road oil, coal tar, water gas tar, coke, oven tar and other petroleum products or bituminous materials.

243—APPARATUS complete, with 550-watt Electric Rheostat Heater; Pyrex distilling flask; reflux condenser; receiving trap; large support stand; extension clamp and clamp holder.

244—APPARATUS complete, Gas Heated, with standard 3½x6 in. copper still No. 187-2; still support No. 187-3; ring burner No. 187-4; Pyrex reflux condenser and receiving trap; large support stand; extension clamp, and two clamp-holders.



244

RESIDUE OF SPECIFIED PENETRATION

A. S. T. M. Designation D243 **A. A. S. H. O. Method T-56**

This Apparatus is suitable for the determination of percentage of residue having a specified penetration at 100 gram, 5 seconds, 77 F. (25 C.), obtained by heating a road oil or a semisolid asphalt having a penetration of more than 100, at a temperature of 480 to 500 F. (249 to 260 C.). When the penetration of the residue is not otherwise stated it shall be understood to be 100. The residue obtained is available for tests as desired.

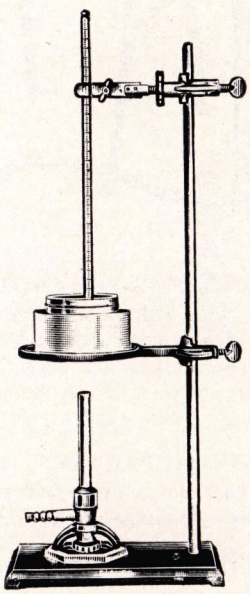
246—RESIDUE OF SPECIFIED PENETRATION APPARATUS. Includes iron stand, clamp, hot plate support, adjustable Tirrill type gas burner (specify kind of gas used), air bath, one dozen sample containers and Fahrenheit thermometer or Centigrade if ordered.

248—AIR BATH only, cast iron.

248-1—SAMPLE CONTAINERS, A. S. T. M.; 6-oz. gill style.

T205-F—THERMOMETER, A. S. T. M. D92; 20 to 760 F.; 5 deg. divisions; length 12 in.

T205-C—THERMOMETER, A. S. T. M. D92, minus 6 to plus 400 C.; 2 deg. divisions; length 12 in.

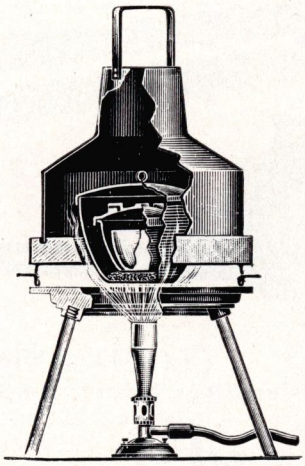


246

CONRADSON CARBON RESIDUE APPARATUS

A. S. T. M. Designation D189 **Federal Specifications 500.13**

This method of test is a means of determining the amount of carbon residue left on evaporating an oil under specified conditions, and is intended to throw some light on the relative carbon-forming propensity of the oil. The results of the test, which furnish pertinent information relative to lubricants for internal combustion engines, domestic oil fuels, and oils used in the manufacture of gas, must be considered in connection with other tests and the use for which the oil is intended.



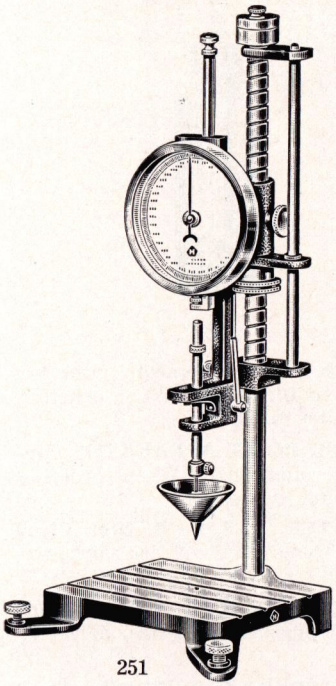
249

249—CARBON RESIDUE APPARATUS. Complete as illustrated with Armco iron hood, molded heat-resistant refractory block and Meker type gas burner. (Specify kind of gas used.)

250—FOUR-UNIT CARBON RESIDUE APPARATUS. Similar to No. 249, but for making four determinations of the same oil, or four different oils. All four units are mounted on an angle iron support and includes four Meker type burners. (Specify kind of gas used.)

CONSISTENCY OF LUBRICATING GREASES AND PETROLATUM

A. S. T. M. Designation D217 **Federal Specifications 31.11**



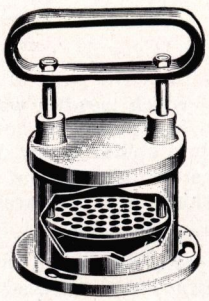
251

This method of test is intended for use in measuring with a penetrometer the unworked or the worked consistency of lubricating greases which have a worked consistency less than 400, and in measuring the original consistency of petrolatum.

252

251—GREASE CONSISTOMETER, Humboldt, for determining the consistency of both hard and soft greases. It is provided with a special mushroom-head penetration needle loaded to a total weight of 150 grams. This is supported by a spring clamp. Consistency or hardness is determined by releasing the clamp and measuring the depth, in millimeters, to which the needle penetrates the grease, what will be indicated on the dial. The dial is 5 in. in diameter, graduated into 400 divisions of 1/10 mm. corresponding to 40 mm. penetration. The dial is easy to read and is protected by a glass cover.

Supplied with A. S. T. M. Grease consistometer needle.



253

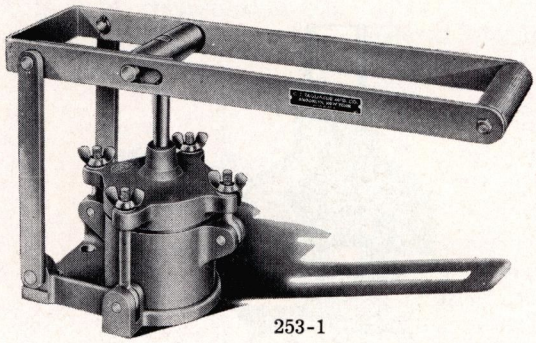
252—GREASE CONSISTOMETER NEEDLE only, Cone-shaped needle according to A. S. T. M.

253—GREASE WORKER, A. S. T. M. standard. Used to work grease to constant consistency in tests where worked consistency is to be measured.

T251-C—THERMOMETER, A. S. T. M. 19 to 27 C.; 0.1 deg. divisions; length 10 in.

T251-F—THERMOMETER, A. S. T. M. 66 to 80 F.; 0.2 deg. divisions; length 10 in.

CONSISTENCY OF LUBRICATING GREASES AND PETROLATUM (Cont'd)

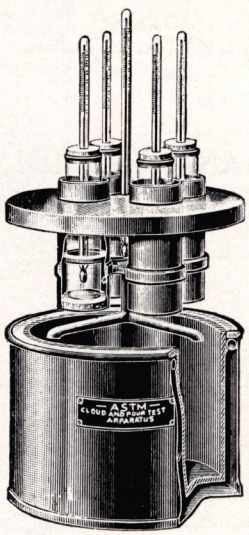


253-1

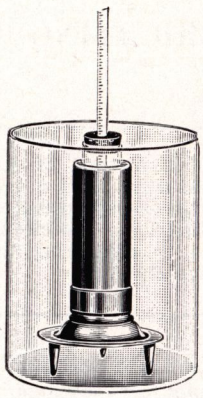
253-1—GREASE WORKER, Lever Type, to facilitate the working of heavy greases. Similar to No. 253, but in addition to the lever, larger space in the cover is provided, hinged bolts and a perforated plate 3/16 inch instead of ⅛ inch thick, which type of construction is more convenient and less fatiguing. This worker may also be operated by hand without the lever.

CLOUD AND POUR TEST APPARATUS

A. S. T. M. Designations D97 **Federal Specifications 20.15**



254



256

258

The cloud point of a petroleum oil is the temperature at which paraffin wax or other solid substances begin to crystallize out or separate from solution when the oil is chilled under definite prescribed conditions. The test for cloud point is intended for use only on oils which are transparent in layers 1½ in. in thickness.

The pour point of a petroleum oil is the lowest temperature at which the oil will pour or flow when it is chilled without disturbance under definite prescribed conditions. The test for pour point is intended for use on any petroleum oil.

254—CLOUD AND POUR POINT APPARATUS, Four-Unit. Complete with 4 test jars and 5 A. S. T. M. Cloud and Pour thermometers. When ordering, specify whether high or low cloud thermometers are wanted, and whether Fahrenheit or Centigrade. (See listing below.)

256—CLOUD AND POUR POINT APPARATUS, Single Unit. Complete with one thermometer, glass test jar, and glass outer jar, as illustrated. When ordering, specify which thermometer is wanted.

258—CLOUD AND POUR POINT APPARATUS, Single-Unit. Complete as illustrated. When ordering, specify which thermometer is wanted.

T258-FH—THERMOMETER, A. S. T. M. High Cloud and Pour; minus 36 to plus 120 F.; 2 deg. divisions; length 8¾ in.

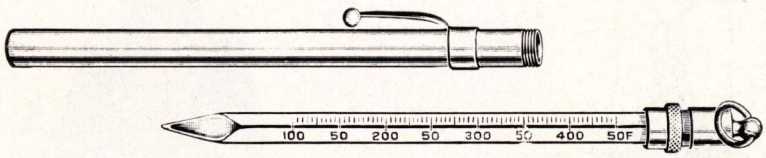
T258-CH—THERMOMETER, A. S. T. M. High Cloud and Pour; minus 38 to plus 50 C.; 1 deg. divisions; length 8¾ in.

T258-FL—THERMOMETER, A. S. T. M. Low Cloud and Pour; minus 70 to plus 70 F.; 2 deg. divisions; length 9 in.

T258-CL—THERMOMETER, A. S. T. M. Low Cloud and Pour; minus 60 to plus 20 C.; 1 deg. divisions length 9 in.

ASPHALT TESTING THERMOMETERS

260



262

260—ASPHALT TESTING THERMOMETER. Also very practical for testing sand and coarse materials. The bulb is of a very sensitive construction, immersed in a bath of mercury contained in a long steel cup which forms the stem. In 10 in. armor case, scale graduated 100 to 450° F. in 5° divisions.

261—ASPHALT TESTING THERMOMETER. Same as No. 246 but with scale graduated from 200 to 650° F. in 5° divisions.

262—ASPHALT TESTING THERMOMETER, Pocket Case Type, plain glass bulb. Graduated 100 to 450° F. in 5° divisions; 6 in. long.

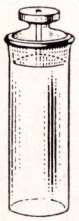
263—ASPHALT TESTING THERMOMETER, Pocket Case Type. Similar to No. 262, but with copper-protected bulb. Graduated 100 to 450° F. in 5° divisions; 6 in. long.

SPECIFIC GRAVITY OF ROAD OILS, ROAD TARS, ASPHALT CEMENTS AND SOFT PITCHES

A. S. T. M. D70 **A. A. S. H. O. Method T-43**

Federal Specifications

SS-R-406



264

266

264—SPECIFIC GRAVITY BOTTLE (Pycnometer), A. S. T. M. Type, Hubbard form; for determining the specific gravity of asphalt cements, soft tar pitches; road oils and road tars. Bottle is made of glass with ground-in stopper having a 1.6 mm. hole; capacity about 24 ml.

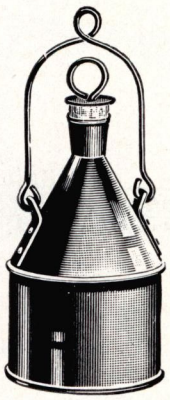
264-1—SPECIFIC GRAVITY BOTTLE, A. S. T. M. Type. Like No. 264, but made of Pyrex glass, and with interchangeable ground glass stopper.

266—SPECIFIC GRAVITY BOTTLE (Pycnometer), Hubbard-Carmick, Erlenmeyer form, a modified Hubbard type, for use with viscous fluids, semi-solid bitumens and emulsions. The bottle is made of glass with ground-in stopper having a 1 mm. hole. The lower surface of the stopper is made cup-shaped to allow air bubbles to escape through the bore. The capacity is about 25 ml. and the weight is about 25 grams. See U. S. Department of Agriculture Bulletin No. 949.

266-1—SPECIFIC GRAVITY BOTTLE, Hubbard-Carmick Type. Like No. 266, made of Pyrex glass, and with interchangeable ground glass stopper.

WEIGHTED OIL SAMPLERS

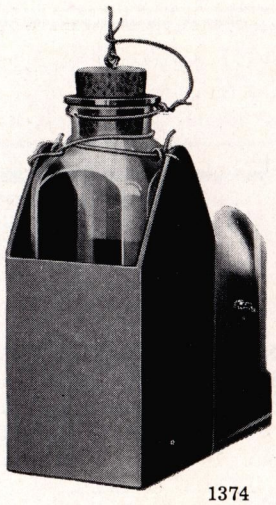
A. S. T. M. D270 **A. A. S. H. O. T-40**



1371

1371—OIL SAMPLER, Barrett Form. Constructed of heavy galvanized iron; lead weighted at the bottom with heavy iron trunnions riveted on; heavy steel wire handle, cork stopper faced top and bottom with metal discs. Capacity about 1/3 gal.; dia. 5⅜"; height 12".

1372—OIL SAMPLER, A. S. T. M. Weighted Beaker. Construction similar to above, but capacity 1 qt.; dia. 3⅜"; neck dia. ¾"; height 12".



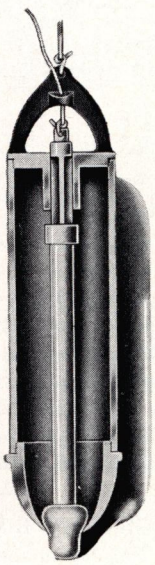
1374

1373—OIL SAMPLER, A. S. T. M. Weighted Beaker. As above, but with neck 1½" dia. for sampling heavy oils.

1374—OIL SAMPLER, A. S. T. M. Weighted Bottle. With ¾" neck opening, for sampling light lubricating oils, etc. Capacity 1 qt. Case is of sheet lead, 7⅝" high.

BACON BOMB SAMPLER

A. S. T. M. D117; D270



1375

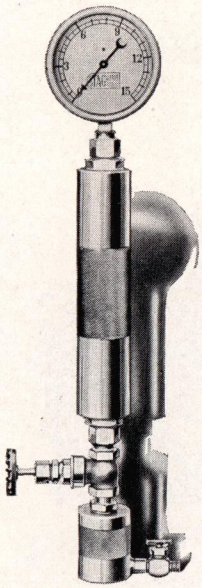
Sampler is designed to take a sample from within ½" of the bottom of a tank car. It is lowered until it strikes the bottom of the tank. The valve then opens automatically, allowing the bomb to fill. As the sampler is lifted, the valve automatically closes. Samples can be obtained at intermediate depths by means of a cord attached to the end of the plunger valve.

Made entirely of brass, heavily nickel plated. Simple in construction and easy to take apart for cleaning.

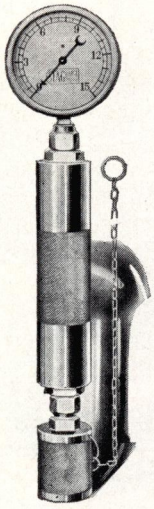
1375—BACON BOMB SAMPLER. Capacity 16 oz.; length 12"; dia. 3".
Other sizes, 4, 8 or 32 oz., to order.

REID VAPOR PRESSURE BOMBS

A. S. T. M. D323 **Federal Specification 120.1**



1377



1376

This method of test is for the determination of the vapor pressure of volatile, nonviscous petroleum products by means of the Reid Bombs.

Bombs consist of two sections or chambers, an upper section or air chamber, and a lower section or gasoline chamber, with provisions on the upper section for mounting the pressure gage. Bombs are made of brass throughout, of extremely sturdy construction and conform to the specifications.

Two types of bombs are available, one for immersion sampling (at atmospheric pressure), and one for pressure sampling, which is equipped with a ¼" needle valve and a ½" gate valve between that air and gas chambers.

1376—REID VAPOR PRESSURE BOMB, for immersion sampling. Complete as shown, but without gage.

1377—REID VAPOR PRESSURE BOMB, for pressure sample. Complete with valves, but without gage.

1378—PRESSURE GAGE, 4½" dial, graduated 0 to 15 lbs. in 2/10 lb. divisions.

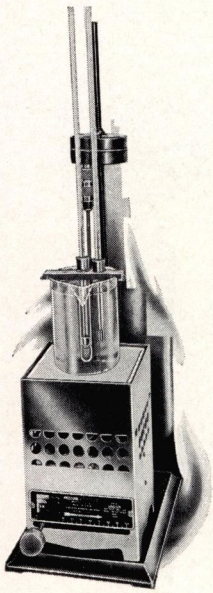
1379—PRESSURE GAGE, 4½" dial, graduated 0 to 50 lbs. in 2/10 lb. divisions.

T1380—BATH THERMOMETER, A. S. T. M. Range 94 to 108 F.; 1/5 deg. div., length 10".

T1381—AIR CHAMBER THERMOMETER, A. S. T. M. Range minus 30 to plus 120 F.; 1 deg. div.; length 12".

DROPPING POINT OF LUBRICATING GREASE

A. S. T. M. D566



1400

This method is intended for use in determining the A.S.T.M. dropping point of lubricating grease. The dropping point is the temperature at which the grease passes from a semisolid to a liquid state under the conditions of the test.

1400—DROPPING POINT APPARATUS—Consists of grease cup, test tube, 400 ml. beaker, electric heater, motor stirrer stand, corks, metal rod, two A. S. T. M. thermometers, range 20 to 580 F., or minus 5 to plus 300 C. if specified and clamps for the thermometers.

1402—DROPPING POINT APPARATUS. As above, less electric heater.

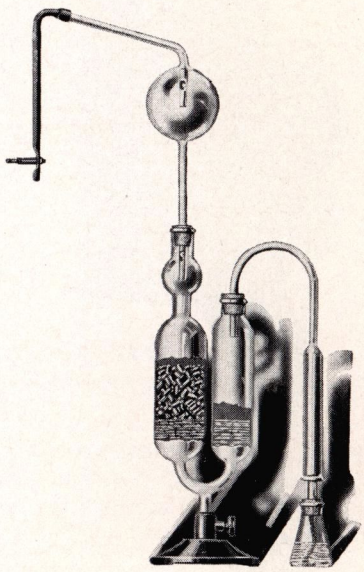
1403—GREASE CUP only.

T1404—THERMOMETER, A. S. T. M. Partial Immersion. Range 20 to 580 F.; 2 deg. divisions; length 15″.

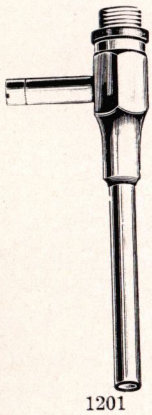
T1405—THERMOMETER, A. S. T. M. Partial Immersion. Range minus 5 to plus 300 C.; 1 deg. divisions; length 381 mm.

SULFUR IN PETROLEUM OILS

A. S. T. M. D90 Federal Specifications 520.12



1408



1201

This method of test is intended for use in the determination of sulfur in kerosene, petroleum naphtha, and other petroleum oils which can be burned completely in a wick lamp. Method may be applied to motor fuels which are mixtures of gasoline and volatile non-petroleum oils.

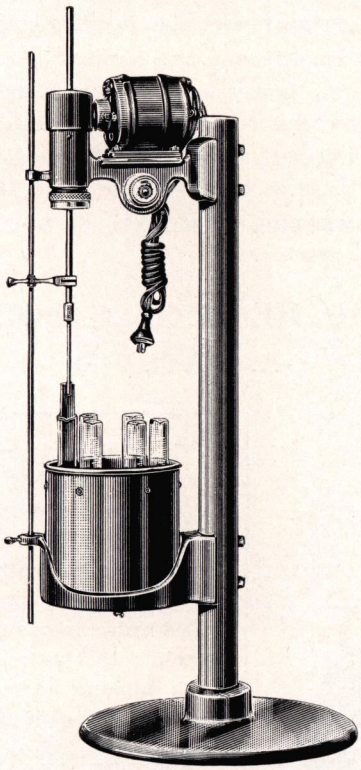
1408—SULFUR IN PETROLEUM APPARATUS, Complete. Includes metal base, glassware including absorber, spray trap, chimney and lamp (all made of Pyrex glass), wick holder with cotton wick, rubber tubing with pinch clamp, and glass beads.

1409—METAL BASE only, with fiber-tipped set screw.

1201—FILTER PUMP—Brass, medium size, for applying continuous suction to sulfur apparatus.

EMULSIFIER

Federal Specifications 320.12 and 320.32



1410

1410—EMULSIFIER, Herschel Type, for emulsibility and demulsibility tests.

A compact silent running apparatus designed to keep a constant paddle speed of 1,500 R.P.M. Slipping is eliminated by direct connection to motor.

Shaft and guide rods are made of stainless steel, bearing of bronze with hardened ball race to take up end thrust.

Paddle is lowered and raised in graduated cylinders without dismantling. All parts are accurately machined. Regularly furnished for 110 Volts, 60 Cycles A.C.; furnished for other voltages and frequencies on special order.

Over-all dimensions: diameter 20 inches; height (paddle raised) 46 inches; weight 90 pounds.

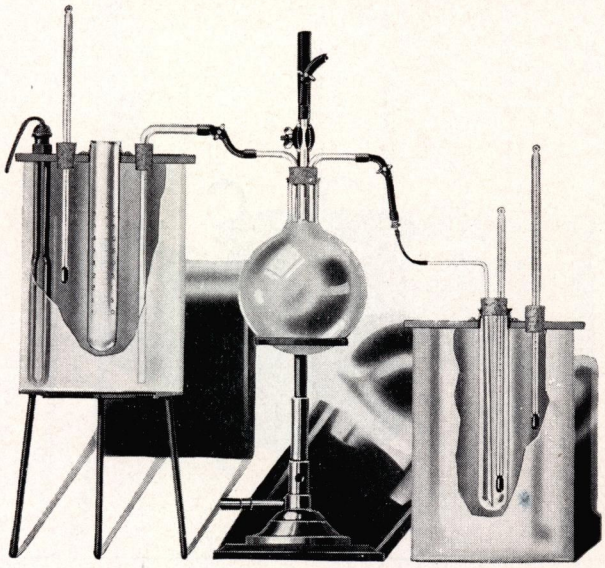
Supplied complete with copper paddle, but without graduated cylinders as illustrated.

1411—EXTRA COPPER PADDLE, for No. 1410 Emulsifier.

1412—GRADUATED CYLINDER, for No. 1410 Emulsifier, 100 ml.

STEAM EMULSION OF LUBRICATING OILS

Federal Specifications 320.6 A. S. T. M. D157



1413

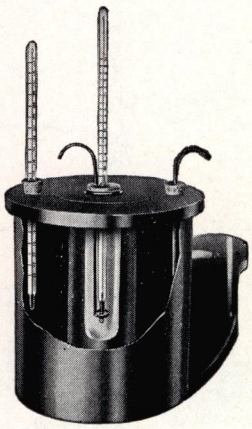
This method is suitable for use on all oils when an emulsion, demulsibility or emulsification test is required. It is commonly used for turbine oils and may be used for other lubricating oils. The A.S.T.M. Steam Emulsion Number (S.E. No.) is the number of seconds required for an oil to separate when emulsified and separated under definitely prescribed conditions.

1413—STEAM EMULSION APPARATUS—Consisting of a Pyrex 1000 ml. glass generating flask, two 6 x 8" glass cylindrical jars, one oil emulsion tube, one Pyrex glass steam delivery tube, three thermometers, emulsion tube and steam lines, stoppers, glass and rubber tubing connections, pinch clamps, two tripods, support stand, and two adjustable Tirrill type burners (specify kind of gas used).

T1414—THERMOMETER, Engraved Stem — General Testing, 0 to 220 F., 1 deg. div., length 275 mm.

MELTING POINT OF PARAFFIN WAX

A. S. T. M. D87



1420

This test determines the temperature at which melted paraffin wax, when allowed to cool under prescribed conditions, first shows a minimum rate of temperature change.

1420—PARAFFIN WAX MELTING POINT APPARATUS. Consists of water bath made of copper with stirrer, inner air bath, wax container (glass test tube 1" dia. x 4" long) with stirrer; and a A.S.T.M. paraffin wax melting point thermometer range 100 to 180 F., and a bath thermometer range 0 to 300 F., or Cent. thermometers if ordered—see listing below.

T1421-F—THERMOMETER, A.S.T.M. Paraffin Wax Melting Point; 100 to 180 F.; 0.2 deg. div.; length 14½".

T1421-C—THERMOMETER, A.S.T.M. Paraffin Wax Melting Point; 38 to 82 C.; 0.1 deg. div.; length 368 mm.

T1422-A—THERMOMETER, Bath; 0 to 300 F.; 2 deg. div.; length 12".

T1422-C—THERMOMETER, Bath, minus 20 to plus 150 C.; 1 deg. div.; length 305 mm.

MELTING POINT OF PETROLATUM

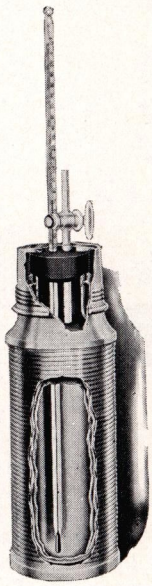
A. S. T. M. D127 Federal Specs. 140.1

1423—MELTING POINT OF PETROLATUM APPARATUS—Complete with two standard test tubes and corks, 500 ml. beaker, one Fahr. wax melting point thermometer and one Fahr. bath thermometer, (or Cent. if ordered), support, Tirrill type gas burner, clamps, wire gauze, etc.

THERMOMETERS, for No. 1423, see Nos. T1421 and T1422, this page.

ACID HEAT OF GASOLINE

A. S. T. M. D481



1415

This method is for determining the acid heat of aviation and motor gasolines. The method employed is indicative of the amount of unsaturated hydrocarbons in the gasoline that is reactive with sulphuric acid under the conditions of test.

Apparatus consists of a Vacuum Bottle especially selected to meet the heat capacity requirements of the test. Bottle is of the highest grade construction.

1415—ACID HEAT TEST APPARATUS—Complete as illustrated, including Fahr. thermometer, or Cent. if ordered.

1416—VACUUM BOTTLE only, calibrated.

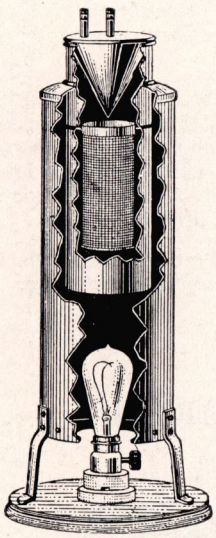
1417—PRESSURE RELEASE TUBE WITH STOPCOCK only.

T1418—THERMOMETER, A.S.T.M. Acid Heat; 30 to 220 F.; 1 deg. div.; length 15".

T1419—THERMOMETER, A.S.T.M. Acid Heat; 0 to 105 C.; 0.5 deg. div.; length 381 mm.

EXTRACTORS FOR BITUMINOUS MASTICS, GROUTS, ETC.

A. S. T. M. D147



1490

1490—BITUMEN EXTRACTOR, New York Testing Laboratory Type, for extracting the bitumen in mastics, grout and like mixtures. For 50 to 500 gram samples of mixtures with coarse aggregates. Consists of a metal cylinder inside of which is fitted a cylindrical vessel; conical condenser, wire basket for the sample and 50 watt lamp. Complete with cord and plug.

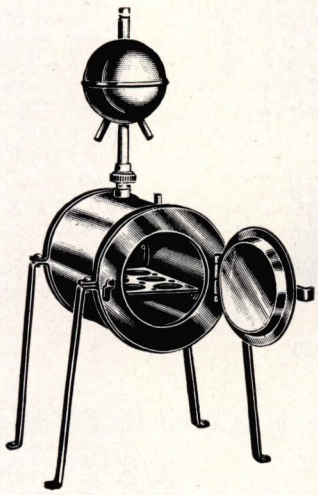
1500—EXTRACTION BASKET only, 80 mesh brass wire.

1510—BITUMEN EXTRACTOR, for 10 to 30 gram samples of mixtures with fine aggregates. Complete with 400 ml. Pyrex flask, extraction cup and block tin condenser. Assembly is also used in the analysis of rubber A.S.T.M. D297 and for grease in knit goods A.S.T.M. D231.

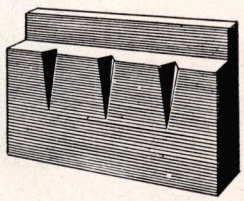
SIEVES, for Sieve Analysis, see catalog No. 392, page 36.

SAMPLING AND ANALYSIS OF COAL AND COKE

A. S. T. M. D271



1540



1745

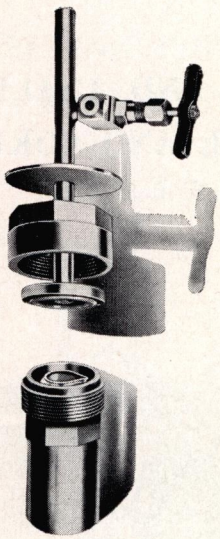
1540—COAL MOISTURE OVEN, for the determination of residual moisture in coal and coke, by air drying the sample. Oven is double walled, with openings for reflux condenser, thermometer and air inlet tube, the latter leading to the drying chamber at the rear to provide dry heated air as required by A.S.T.M. for renewing the air in the drying chamber. The hinged door is double walled. The copper shelf is removable and has six perforations for capsules. Oven and condenser are made of polished copper, supported by a japanned iron stand. Overall dimensions: 9″ x 8″ x 18″ high. Complete as illustrated; for gas heating. Capsules or burner not included.

1541—COAL MOISTURE OVEN. Like No. 1540, but equipped with electric heating units. Specify 110 or 220 volts (300 watts).

1543—CAPSULE—Porcelain, without cover for use with Nos. 1540 and 1541.

1544—COVER—Aluminum, for No. 1543.

1745—CONE MOLD, made of brass. For making three coal-ash test cones ¾″ high and ¼″ on a side for use in the Determination of Fusibility of Ash according to A.S.T.M. D-271.



1550

GUM STABILITY BOMB

A. S. T. M. D525

1550—GUM STABILITY BOMB. This apparatus is used to determine the tendency of gasoline to form gum in storage in accordance with A. S. T. M. Designation D525.

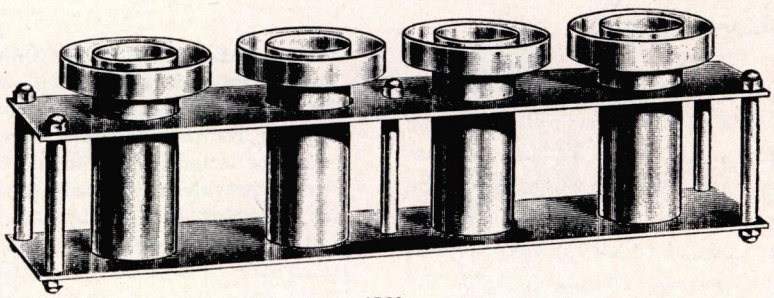
The apparatus consists of a stainless steel bomb with a snug fitting Pyrex glass liner, special composition gaskets and a needle valve.

In use, the sample is placed in the bomb, and oxygen introduced until a pressure of 125 lbs. is obtained. This pressure is later adjusted to 100 lbs. and the bomb placed in a boiling hot water bath. The pressure is read at regular intervals and the time elapsed before the pressure drops 2 lbs. in a period of 15 minutes is recorded as the induction period.

Supplied complete with bomb, on Pyrex liner, needle valve and six composition gaskets, but without bath or gauge.

LACQUER CONSISTENCY APPARATUS

A. S. T. M. DESIGNATION D333



1560

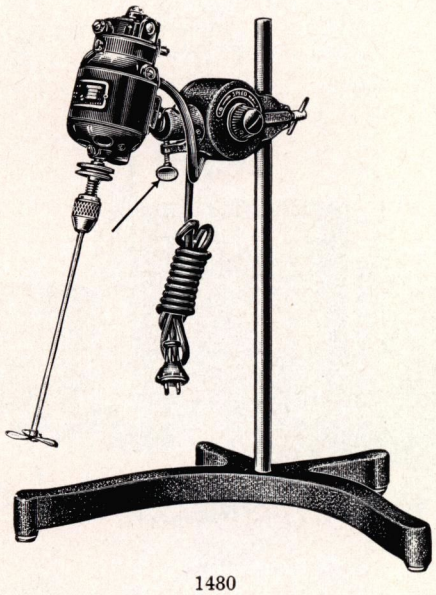
This test method is for determining the consistency of Nitro-Cellulose Clear Lacquer and Lacquer Enamels. The sample to be tested and the consistency cup is brought to a temperature of 25 C. With consistency cup mounted over the receiving flask and with the outlet of the cup closed by means of the finger, the sample is poured into the cup until it is filled to overflowing. The number of seconds from the time the finger is moved from the orifice outlet until the meniscus reaches 50 ml. on the graduated cylinder, is determined by means of a stopwatch and recorded as the consistency of the material.

1560—LACQUER CONSISTENCY APPARATUS — Consists of set of four consistency cups, one each diameter of orifice 0.07, 0.10, 0.15 and 0.25 inch with rack for holding them and includes support, ring and clamp, but does not include receiving cylinder. Cups are made of brass with stainless steel orifice discs, in accordance with A.S.T.M. specifications.

1561—RECEIVING CYLINDER, Paint Consistency, A.S.T.M., for receiving the outflow of enamel in consistency tests with No. 1560 Consistency Apparatus. Cylinder is graduated to contain 50 ml. at 25 C. The single graduation mark completely encircles the cylinder.

For **STOPWATCH,** see page 17.

LABORATORY MOTOR STIRRERS



1480

1480—MOTOR STIRRER, Universal, Large Model, Heavy Duty, universally adjustable to any desired angle by means of a ball and socket lever arrangement. Held firmly in position by lightly tightening a thumb screw as indicated by arrow in illustration.

Both ends of the Universal motor shaft can be utilized for stirring and is controlled by a rheostat. One end of the shaft gives speeds from 2,000 to 5,000 R.P.M. and the other from a few turns up to 500 R.P.M.

Combination V pulley and adjustable chuck fits on both the high and low speed shafts.

A two inch propeller with nine inch shaft is furnished as standard equipment.

The sturdy base will center vessels up to 12 inches in diameter. Supporting rod is 20 inches long.

Motor has a black enameled finish, rheostat housing and base are black crystalline and all other parts are cadmium plated.

Furnished complete as shown in illustration.

Regularly furnished for 110 Volts A.C. and D.C. 220 Volts special.

1482—MOTOR STIRRER, Small Model. This Laboratory Stirrer is adjustable by means of a ball joint. Non-sparking, brushless, for stirring inflammable liquids. Speeds can be obtained from a few revolutions up to 3,000 R.P.M. with rheostat control, which also acts as an "OFF" switch, enclosed in a ventilated aluminum housing. Has an adjustable chuck which will accommodate glass or metal shafts. A six inch monel shaft with inch and one-half monel propeller is standard equipment.

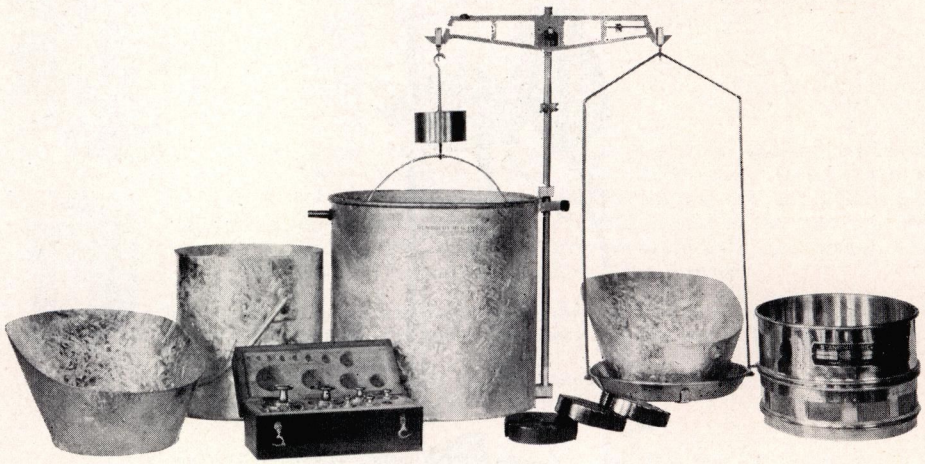
Stirrer is of sturdy construction, made of bronze and aluminum, black enamel finish and nickel plated fittings, with six feet of rubber covered cord and plug. Total weight of stirrer is four pounds.

*For 110 Volts 50 to 60 Cycles A.C. current only.

*Can also be furnished with Universal Type Motor with a speed of 5,000 R.P.M., of the same construction as above, for 110 and 220 Volts.

EUREKA TESTING OUTFIT

(Dunagan Buoyancy Apparatus)



270

270—EUREKA TESTING OUTFIT (Dunagan Buoyancy Apparatus). U. S. Patent No. 1,989,003. Designed by Prof. W. M. Dunagan for use in performing the following tests:

1. **Specific Gravity of Fine and Coarse Aggregates.**

2. **Free Moisture or Absorption of Fine and Coarse Aggregates.**

3. **Silt Determination.**

4. **Analysis of the Constituents of Fresh Concrete. (See Journal of the American Concrete Institute, Vol. 1, December, 1929, page 202; also A. S. T. M. 1931 Proceedings, Vol. 31, Part I, page 383, and Iowa State College Bulletin 113, "A Proposed System for the Analysis and Field Control of Fresh Concrete," Vol. XXXI, May, 1933, No. 49.)**

5. **Sieve Analysis of Aggregates for Concrete.***

*Sieves for this purpose are not included and are listed on pages 50 and 51.

These tests are performed with one article of equipment without recourse to heating or drying any of the materials. (All that is needed is the apparatus and fresh water.)

The apparatus is rugged and permanent, portable, and the results obtained are within a degree of accuracy required by the most rigid specifications. All tests can be performed at a minimum of time.

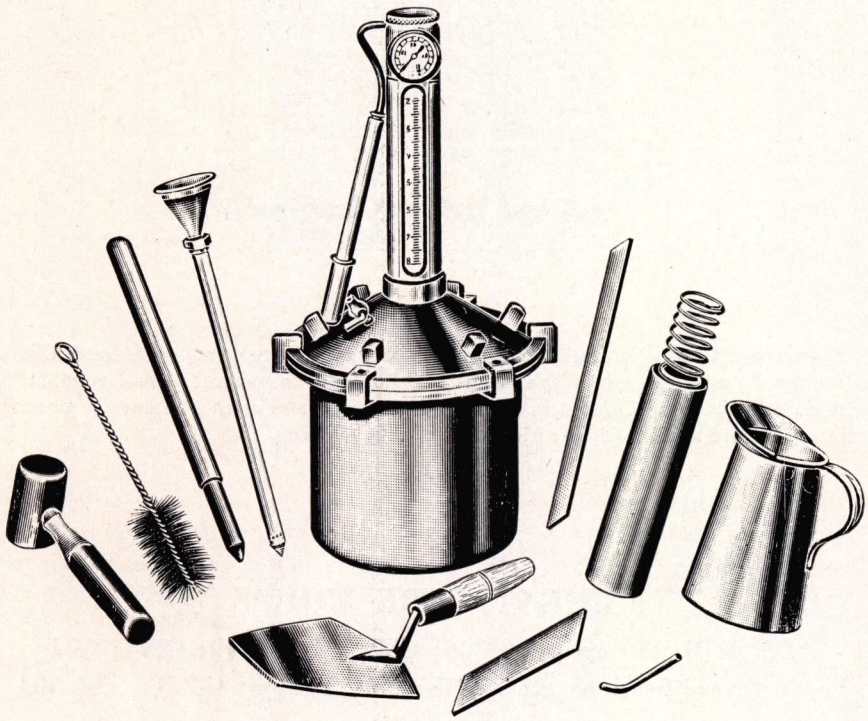
In addition to the equipment illustrated, a large container with cover is furnished. This container is used for washing the material when tests are made in the field, and when not in use all the equipment is packed into this container, making it a compact field kit.

Also a short stirrup and pan is furnished for use in dry weighing for making sieve analysis of aggregates for concrete.

The pail with handle (overflow bucket) shown in illustration has a capacity of ¼ cu. ft. and may be utilized as a measure for unit weight determinations of aggregates.

Furnished with "Manual of Control Tests for Portland Cement Concrete" serving as directions for use.

ENTRAINED AIR INDICATORS



275—ENTRAINED AIR INDICATOR, for measuring the percentage of air entrained in fresh concrete mixtures by the pressure method, and for determining the aggregate correction factor.

See Journal **American Concrete Institute,** vol. 18, No. 9, May 1947, pp. 1053-1072 "Development and Study of Apparatus and Methods for the Determination of the Air Content of Fresh Concrete," also **American Society for Testing Materials Proceedings,** vol. 47, 1947, pp. 833-864 "Procedures for Determining the Air Content of Freshly-Mixed Concrete by the Pressure Method," by Carl A. Menzel, covered by bulletins 16 and 19 issued by the Research Laboratory of the Portland Cement Association.

The apparatus consists of a round bottom, flanged, steel bowl, 8 in. in diameter and 8 in. deep with a capacity of about 0.22 cubic feet, conical cover with rubber gasket and clamps, socket wrench for set-screws in clamps, glass measuring tube graduated from 0 to 8% air in 0.1% divisions, dial type pressure gauge, air pump, tamping rod, trowel, rawhide mallet, strike-off bar, etc. Also a stout wooden chest with handles, hinged cover and hasp is furnished for carrying all of the components and accessories. The chest also serves as a support for the indicator during the determination.

The indicator operates by the pressure method. A representative sample of fresh concrete is placed in the bowl, struck off flush with the flange, the cover is clamped in place and filled with water. Pressure is applied and the entrained air in the concrete is compressed in accordance with Boyle's Law.

Supplied with operating instructions. Shipping weight Appr. 75 lbs.

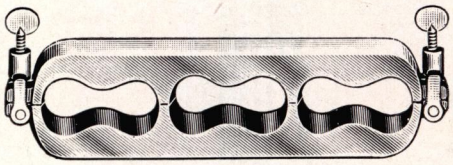
277—ENTRAINED AIR INDICATOR. Same as No. 275, but 0.44 cu. ft. capacity. Shipping weight appr. 100 lbs.

279—ENTRAINED AIR INDICATOR. Same as No. 275, but 2.8 cu. ft. capacity and not furnished with chest. Shipping weight appr. 310 lbs.

CEMENT BRIQUET MOLDS

A. S. T. M. C61; C77; C26; C9; C10; C74 **A. A. S. H. O. Methods T-1; T-35**

Federal Specifications SS-C-158; SS-C-161



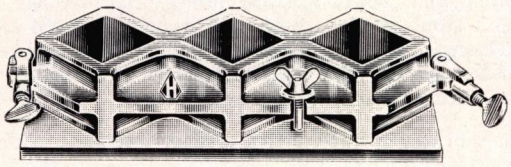
280

280—BRIQUET MOLD, Three Gang. For making three standard briquets for tensile strength tests. The mold is accurately machined and the shape of the briquets are exactly in accord with the specifications. Mold is made of bronze having a hardness of more than B55 Rockwell number (Brinell number 95) and has sufficient material in the sides to prevent spreading during molding.

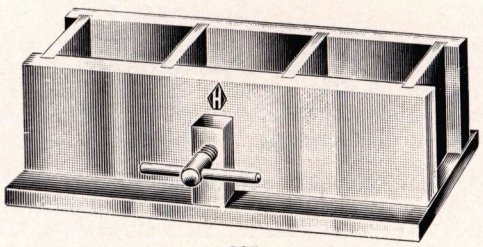
CEMENT CUBE MOLDS

A. S. T. M. Designations C26; C87; C91; C109; C141; C74

Federal Specifications SS-C-181b; SS-C-158; SS-C-161; SS-L-361



282



285

282—CEMENT CUBE MOLD, Three-Gang. Made of forged bronze. For making three 2 in. cubes at one filling for compression strength tests of Portland Cement Mortars, Lime and Gypsum. Mold is accurately machined and provided with reinforcing rib to prevent spreading during molding. With detachable brass base plate.

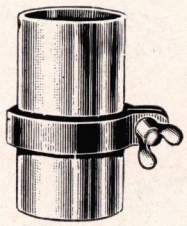
283—CEMENT CUBE MOLD. Like No. 282, but without base plate.

285—CEMENT CUBE MOLD, Three-Gang, Parallel Arrangement. For making three 2 in. cubes at one filling for compression strength tests of Portland Cement Mortars, Lime and Gypsum. Made of chrome-plated steel with parallel partitions, mortised sides and base plate. A single screw-clamp secures the parts to the base plate. Mold exceeds by far all tolerances for accuracy required in the specifications. Furnished complete with base plate.

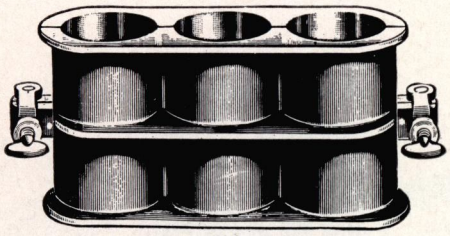
286—TAMPER, Cube Mold, A. S. T. M. For tamping cement mortars into Cube Mold in accordance with the specifications. Tamper is made of Bakelite, has a cross-section of ½ by 1 in. and is 6 in. in length.

CYLINDER MOLDS

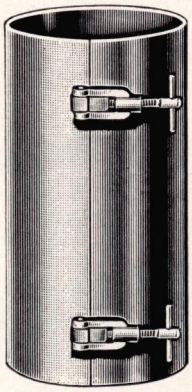
A. S. T. M. C31; C39; C87 **A. A. S. H. O. Methods T-22; T-23; T-35**



290



292



293-296

290—CYLINDER MOLD, Single, 2 by 4 in. For making cylindrical test pieces 2 in. in diameter and 4 in. high, for compression. Made of brass and provided with collar and screw clamp.

292—CYLINDER MOLD, Three-Gang, 2 by 4 in. Similar to No. 290, but for making three cylindrical test pieces 2 in. in diameter and 4 in. high at a time. Mold is made entirely of hard bronze and accurately machined.

293—CYLINDER MOLD, Single, 3 by 6 in. Similar to No. 290, but made of steel and fitted with quick-acting clamps for closing and opening mold.

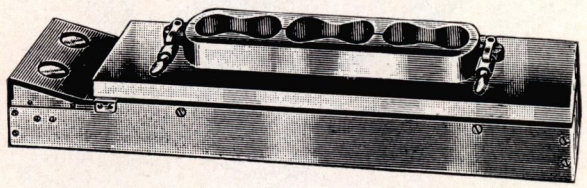
294—CYLINDER MOLD, 6 by 12 by ⅛ in. Wall. For making cylindrical test pieces of concrete 6 in. in diameter and 12 in. high for compression tests. The mold is made of steel with slit along one element, but instead of the collar for holding mold together, two quick-acting clamps are fitted to mold and when closed will give 6 in. inside diameter. When opened mold will spring apart slightly so as to permit removal of the molded concrete without damage.

295—CYLINDER MOLD, 6 by 12 by ¼ in. Wall. Same as No. 294, but heavier with ¼ in. wall and furnished with detachable base plate.

304—CYLINDER MOLD, Waxed Cardboard, 6 by 12 in. For making cylindrical test pieces of concrete 6 in. in diameter by 12 in. high. (Packed 16 molds to a carton).

296—CYLINDER MOLD, 8 by 16 by ¼ in. Wall. Same as No. 294, but 8 in. in diameter and 16 in. high for making cylindrical test pieces of concrete which contains aggregates larger than 2 in. in size. Furnished with detachable base plate.

DELIMETER



318

318—DELIMETER, Humboldt. This illustration is of our Delimeter, the use of which is to subject all the briquets to the same standard pressure while being molded. It is a well known fact that different pressures used while molding cement briquets will give different results in test.

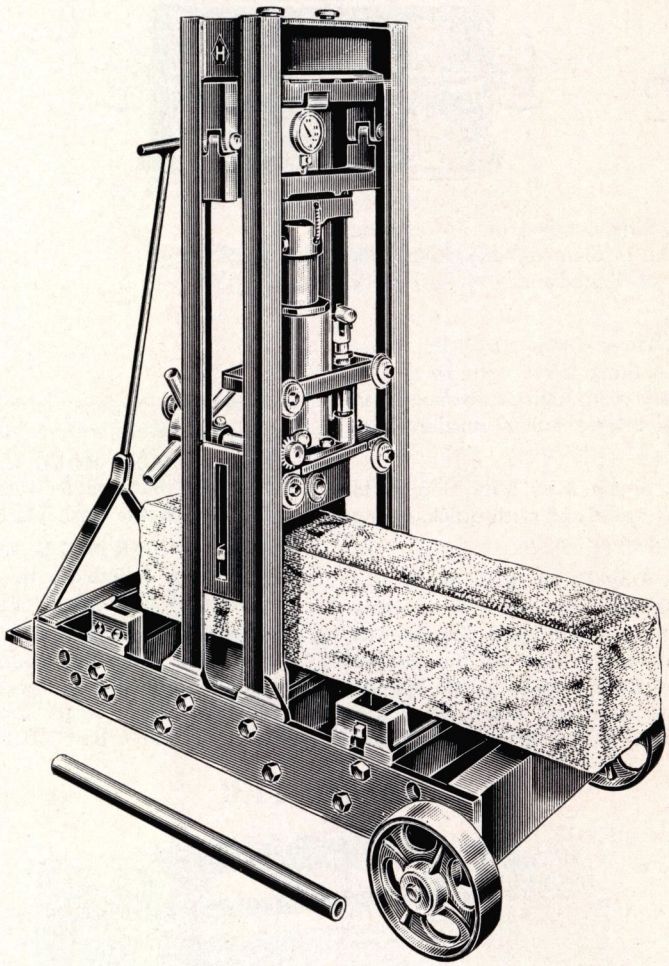
The operation of this apparatus is a simple one. The outfit is designed for a Humboldt Standard Three Gang Mold. The mold shown in the illustration is placed on a glass plate and the operator observes the two six volt bulbs to operate the red and white flash, depending on the pressure applied to the mold.

According to the specifications, not less than 15 lbs. and not more than 20 lbs. pressure shall be applied to cement briquets during the molding operation. The white light is arranged so that a load of from 15 to 20 lbs. pressure operates it, but when the pressure reaches 20 lbs. or exceeds that, the red light flashes, telling the operator to reduce the pressure on the mold. Such an automatic apparatus will allow the operator to work quickly and easily at the same time producing a uniform product.

This apparatus comes equipped with glass plate and two six volt bulbs to operate the red and white lights in connection with a 110 volt, 60 cycle, single phase alternating current transformer and connecting cords.

CONCRETE BEAM TESTING MACHINE

A. S. T. M. Designation C78 **A. A. S. H. O. Method T-97**



297

297—CONCRETE BEAM TESTING MACHINE, for determining the flexural strength of concrete beams, using the simple beam with 3rd point loading. Machine is almost entirely made of steel and is well adapted for laboratory or field use where a light compact machine is desired for determining the modulus of rupture of concrete.

The modulus of rupture up to a maximum of 1333 lb. is indicated direct on the micrometer dial without any further computation on a 6 by 6 in. specimen on 18 in. span and the machine is readily adjusted so the modulus of rupture up to about 1100 lb. can be read on 8 by 8 in. specimens on 24 in. span. This latter reading requires a small computation.

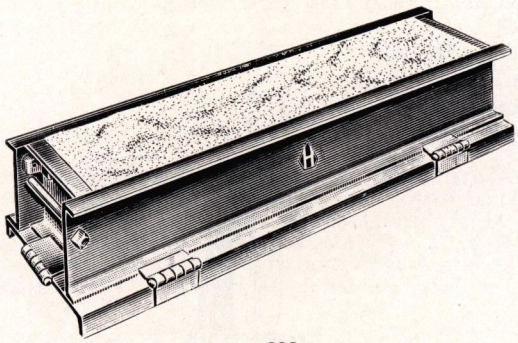
The load is measured by a carefully calibrated device constructed from a special heat-treated steel; exceptionally rugged and will not get out of adjustment even though roughly handled. It is similar to that used by the U. S. Bureau of Public Roads and differs only in that it is made into a more commercial type of portable outfit and the measuring device is calibrated to read modulus of rupture direct on the dial indicator.

The load is applied uniformly and slowly as is required in the specifications with little effort on the part of the operator.

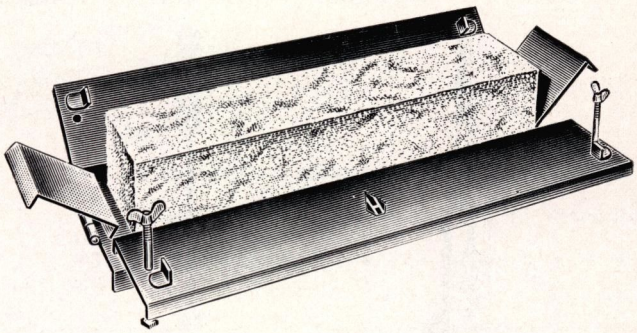
The vertical part of the machine is detachable so that the entire outfit can be easily handled and moved from place to place by one man only. Length 38 in.; breadth 18 in.; height 41 in.; net weight 245 lbs.

CONCRETE BEAM FORMS

A. S. T. M. Designation C78 **A. A. S. H. O. Method T-97**



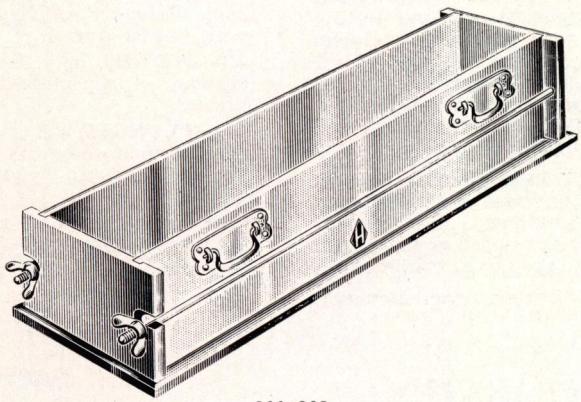
298



299

298—BEAM FORMS, 6 by 6 by 30 in. For making uniform concrete test beams 6 in. high by 6 in. wide by 30 in. long. Made from structural steel shapes. Sides and ends of the form are fastened to the base by means of heavy hinges to permit the removal of the beam specimen without injury.

299—BEAM FORMS. Like No. 298, but for making test beams 8 in. high by 8 in. wide by 42 in. long.



300-303

These forms consist of separable base plate, sides and end plates made of cold-rolled steel ½ in. thick. This heavy construction prevents warping or spreading.

The sides fit into channels cut in the end plates, each end plate being attached to the sides by two screws. Dowel pins in the bottom of the sides fit into holes in the base plate, thus preventing the mold from shifting during the tamping and molding operations.

Base plate, sides and end plates are quickly disassembled by unscrewing four screws.

300—CONCRETE BEAM FORM. For 6 by 6 by 18 in. specimens.

301—CONCRETE BEAM FORM. For 6 by 6 by 24 in. specimens.

302—CONCRETE BEAM FORM. For 6 by 6 by 27 in. specimens.

303—CONCRETE BEAM FORM. For 6 by 6 by 30 in. specimens.

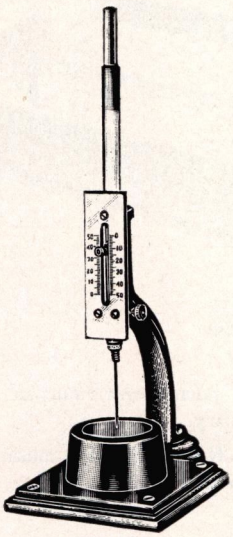
Other sizes furnished to order.

VICAT APPARATUS

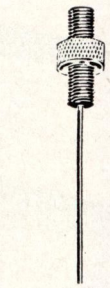
For determining Consistency and Setting Time of Portland Cement, Lime, Gypsum, and Keene's Cement

A. S. T. M. C6; C9; C10; C26; C74; C77; C61; C91; C110; C141. A. A. S. H. O. Method T-1

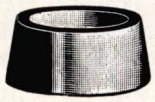
Federal Specifications SS-C-158; SS-C-161; SS-C-181b; SS-L351



305-306



307

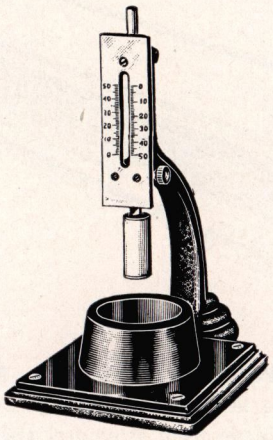


308

305—CEMENT CONSISTENCY TESTER, Vicat Needle, for determining the normal consistency and setting time of cement. Equipped with reversible stainless steel plunger 1 cm. diameter at one end and with 1 mm. diamter stainless steel needle at other end; plunger and needle with adjustable indicater weigh 300 grams. Scale is graduated from 0 to 50 mm. reading up and down. Furnished with hard rubber mold.

306—CEMENT CONSISTENCY TESTER, Vicat Needle, Improved. Similar to No. 305, but with scale graduated from 0 to 40 mm. reading up and down. With the adjustable indicator point set at the upper or lower zero mark, enables the operator to take direct readings.

307—EXTRA NEEDLE, stainless steel, 1 mm. diameter.



309-312

308—EXTRA HARD RUBBER MOLD, for Nos. 305, 306, 309 and 312.

309—GYPSUM CONSISTENCY TESTER, Modified Vicat, for determining the consistency of calcined gypsum. Diameter of plunger 19 mm.; weight of plunger with rod 50 grams.

310—WEIGHT only, for No. 309, for testing the consistency of gypsum mixtures under a weight of 150 grams.

311—PLUNGER with rod only, as used on No. 309. Supplied with bushings to fit No. 305 Vicat needle stand.

312—HYDRATED LIME CONSISTENCY TESTER. Similar to No. 309, but with plunger 12.5 mm. in diameter and weighing 30 grams.

313—PLUNGER with shaft only, for determining the consistency of hydrated lime. For use with No. 305 Vicat needle stand.

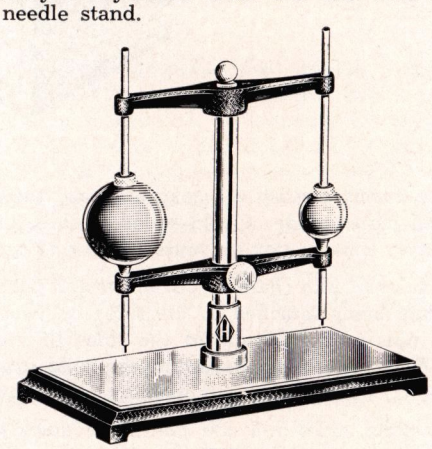
GILLMORE APPARATUS

For Measuring the Setting Time of Portland Cement and Masonry Cement.

A. S. T. M. C9; C10; C77; C91; C141; C74.
A. A. S. H. O. Method T-1

Federal Specifications SS-C-158; SS-C-181b

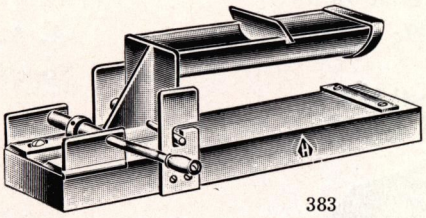
315—CEMENT SET-TIME TESTER, Gillmore Needles. Apparatus consists of two stainless steel needles cylindrical in shape for a distance of about $\frac{3}{16}$ in., one $\frac{1}{12}$ in. in diameter weighing $\frac{1}{4}$ lb. and the other $\frac{1}{24}$ in. in diameter weighing 1 lb. Mounted on metal support with adjustable lower bar.



315

BURMISTER MORTAR FLOW TROUGH

A. S. T. M. C185



383

383—BURMISTER MORTAR FLOW TROUGH for determining the air content of portland-cement mortar. It consists of a hemicylindrical trough of brass closed at one end and operated by a cam to produce a drop of 1½ in. from the horizontal position at the open end of the trough. Mounted on a solid steel base.

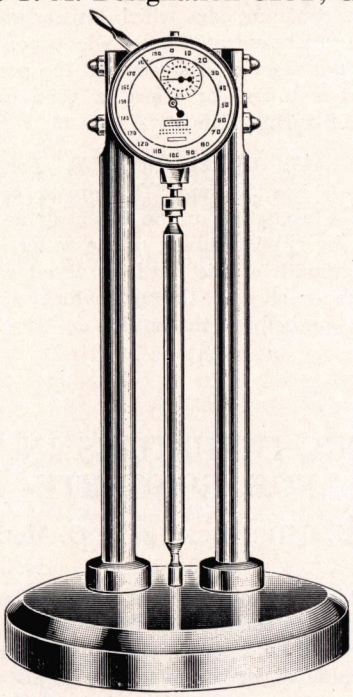
384—CYLINDRICAL BRASS MEASURE 500 ml. calibrated.

385—TAMPING ROD, bullet-pointed, ¼ in. diameter and 10 in. in length.

706—STRAIGHTEDGE, steel, 12 in. long, 3/16 in. thick.

VOLUME CHANGE INDICATOR

A. S. T. M. Designation C151; C157



324

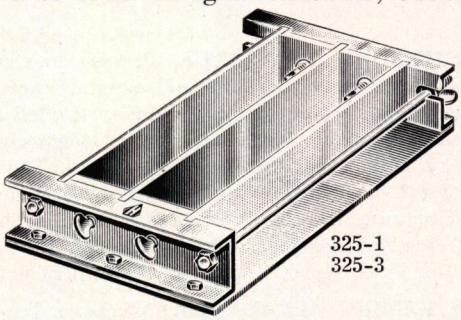
324—VOLUME CHANGE INDICATOR. For measuring length changes of neat cement or cement mortar prismatic specimens or concrete cylindrical specimens, over an effective gage length of 10 in.

Instrument is equipped with a special dial gage reading to 0.0001 in. and is furnished with a standard steel test bar for checking dial readings.

325—VOLUME CHANGE INDICATOR. Like No. 324, but modified with one upright.

MOLDS FOR SPECIMEN BARS

A. S. T. M. Designation C151; C157



325-1
325-3

325-1—BEAM MOLD, Two-Gang. For making two mortar test specimens, 2 in. square at one filling, for use in test for Volume Change of Cement Mortar.

Mold is made of C. R. steel with base plate, removable partitions and end plates. The end plates have provisions for casting contact points into the ends of the specimens so that the effective gage length is 10 in. between the inner ends of the imbedded gage points.

325-2—CYLINDER MOLD, Single. For horizontal casting of cylindrical concrete test specimen in accordance with **A. S. T. M. Specifications C157** determining volume changes of concrete, with aggregates not exceeding ¾ in.

Mold is made of steel, cylindrical in shape with a filling slot 1 in. wide along one element and provided with end plates. The end plates have provisions for casting contact points into the ends of the specimens, so that the effective gage length is 10 in. between the inner ends of the imbedded gage points.

325-3—BEAM MOLD, Two-Gang. Like No. 325-1, but for making two neat cement test specimens 1 in. square at one filling, for use in Autoclave Expansion Test of Portland Cement, **A. S. T. M. C151.**

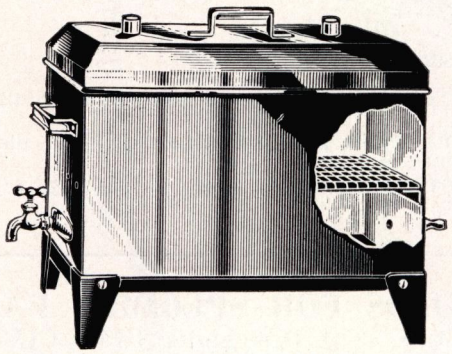
326—CONTACT POINTS, Stainless Steel, for prismatic or cylindrical test specimens Nos. 325-1, 325-2 and 325-3.

STEAMING APPARATUS

For Testing Soundness of Portland Cement, Masonry Cement and Hydrated Lime

A. S. T. M. Designations C6; C9; C10; C74; C77; C91; C141

Federal Specification SS-C-158
A. A. S. H. O. Method T-1



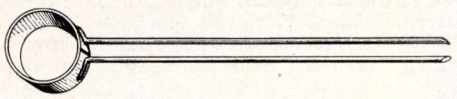
331

331—STEAMING APPARATUS. For use in steaming standard test pats of portland and masonry cement, or hydrated lime, in accordance with the tests cited above. Apparatus consists of a heavy copper steam chest 15 by 15 by 30 in., supported by an iron stand. The lower part of the chest is provided with a hose connection for maintaining the supply of water, and a drain cock for cleaning purposes. A wire mesh shelf, 1 in. above the water level, serves to support the cement pats.

332—STEAMING APPARATUS. As above, but electrically heated and controlled by three heat switch. Maximum current consumption 2500 watts.

Mention voltage when ordering.

CEMENT SOUNDNESS TESTER



335

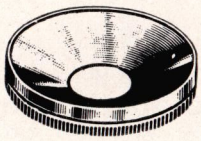
335—CEMENT SOUNDNESS TESTER, Le Chatelier. This mold is used in the determination of the Soundness of Cement, by measuring the expansion of cement when heated for a period of time in an atmosphere of steam or boiling water. The mold consists of a brass split ring, to the ends of which are fastened two long parallel indicating arms. As the cement expands, the ring is spread and the distance between the free ends of the indicating arms is increased giving an index of the degree of soundness.

PAT MOLD

A. S. T. M. C6; C9; C10; C74; C77; C91; C141

A. A. S. H. O. Method T-1

Federal Specifications SS-C-158; SS-C-181b; SS-L-361



333

333—SOUNDNESS TEST MOLD, Pat Type. For making pats used in the Soundness and Setting Time Tests.

This mold is of solid brass, 3 in. in diameter and ½ in. thick. The interior is the shape of a frustum of a cone with the lower base 3 in. in diameter and the upper base 1 in. in diameter. Around the lower base is a ½ mm. retaining edge which insures the pat being of uniform thickness at the outside edge. The outer surface of the mold is grooved, and the portion above the groove is milled to afford a good grip on the wetted mold during filling.

334—CONSTANT LEVEL BOTTLE. For use with Steam Chests Nos. 331 and 332. Consists of a 1 gallon bottle with a tubulature on the side near the bottom for connection by rubber tubing to the water inlet of the tank. The mouth of the bottle is fitted with a perforated rubber stopper through which a glass tube passes into the body of the bottle.

ORGANIC IMPURITIES IN SANDS FOR CONCRETE

A. S. T. M. C40 A. A. S. H. O. Method T-21

This test approximately determines the presence of injurious organic compounds in natural sands which are to be used in cement mortar or concrete. The principal value of the test is to furnish a warning that further tests of the sands are necessary before they are approved for use.

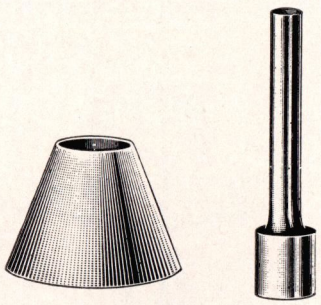
349—GRADUATED GLASS BOTTLE, 12 oz. capacity, used for making the reference standard color and test solutions in accordance with the specifications.

349-1—SODIUM HYDROXIDE, 1 lb. bottle, sticks. Used for making reference standard color and test solutions.

SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE

A. S. T. M. Designation C128

A. A. S. H. O. Method T-84



336

336—CONICAL MOLD AND TAMPER, for determining absorption of fine aggregate in accordance with standard method of test for Specific Gravity and Absorption of Fine Aggregate. The test is based on the principle that moist sand containing free water can be shaped into forms by light pressure, while dry sand cannot.

In conducting the test approximately 1000 gram of fine aggregate selected from the sample by the method of quartering is immersed in water for 24 hours, then drained, and uniformly dried by stirring while exposed to a current of warm air. This operation is continued until the sand approaches a free flowing condition. The conical mold with top and bottom diameters of 1½ in. and 3½ in. respectively, and 2⅞ in. high, is filled with sand, lightly tamped 25 times with the 12 oz. metal rod having a flat face 1 in. in diameter. The cone is then lifted vertically. If the sand does not slump, free moisture is still present, drying is resumed, and trials repeated until slumping occurs. This indicates that the sand is surface-dry, and its weight is taken. To insure that the sand has not been dried too much, a few milliliters of water are mixed with the sand, allowed to stand in a covered container for 30 minutes and the cone test is repeated. With free water present, the cone should not slump. The weight of the sample is again taken, and the sample oven-dried to constant weight. The percentage of absorption is computed from the average of the weight of the dampened sand, and its oven-dry weight.

PYCNOMETER TOP

A. A. S. H. O. Method T-15

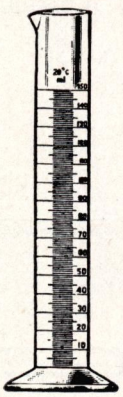
338

338—PYCNOMETER TOP, for determining the specific gravity of fine aggregate. Made of spun brass with ⅜ in. hole and fits on 1 or 2 qt. Mason screw cap jars. The jar is first filled with the sand and weighed, then water added until completely filled, and weighed. The jar is then emptied and filled completely with water and weighed. From the results obtained, the specific gravity of the sand can be calculated. Furnished without jar.

CEMENT CYLINDER

A. S. T. M. Designation C77

A. A. S. H. O. Method T-1

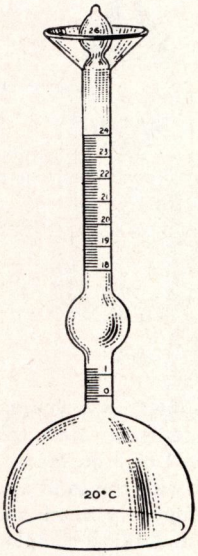


339

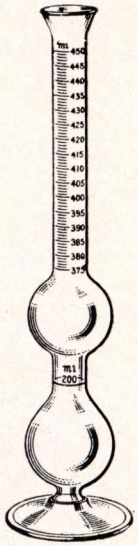
339—CYLINDER, Graduated, Cement Testing. For use in measuring the quantity of water required by making neat cement and mortar mixes. Calibrated to deliver 150 ml. in subdivisions of 1 ml. with an accuracy plus or minus 1.0 ml. With heavy molded base and pourout.

SPECIFIC GRAVITY FLASKS

A. S. T. M. C69; C70; C77



340



346

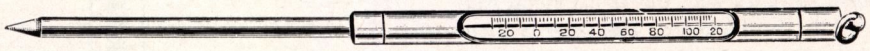
348

340—SPECIFIC GRAVITY BOTTLE, LeChatelier. For determining specific gravity of Portland Cement.

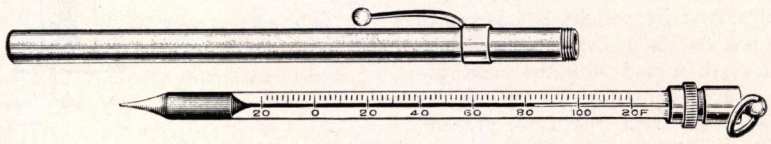
346—SPECIFIC GRAVITY FLASK, Chapman, A. S. T. M. For determinations of approximate percentage of voids and surface moisture in fine aggregates. It consists of two bulbs with graduated neck providing a capacity of 200 ml. to the graduation mark between bulbs and with graduations beginning above the second bulb at a point corresponding to a combined volume of 375 ml. Graduated upward to 450 ml. in divisions of 1 ml. Includes No. 348 Wire Plunger.

348—WIRE PLUNGER, for use with No. 346 Flask. A rubber disc on the end of a stiff wire for use as an agitator to remove entrained air while the flask is being filled.

CONCRETE THERMOMETERS



352



354

352—THERMOMETER. For determining temperatures of concrete. In 10 in. armor case. Range minus 30 to plus 120 deg. F.

354—THERMOMETER, Pocket Type. For determining temperatures of concrete. Range minus 20 to plus 120 deg. F. Length 6 in.

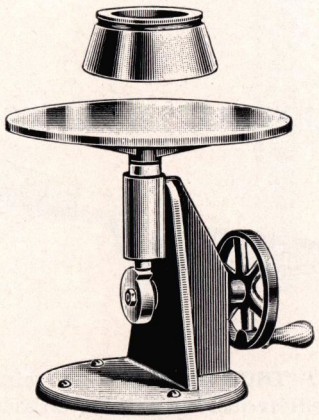
FLOW TABLES

For determining the Flow (Consistency) of Portland Cement Concrete, Cement Mortar, Masonry Cement and Hydrated Lime.

A. S. T. M. C124; C39; C87; C91; C141

A. A. S. H. O. Methods T-71; T-22

Federal Specifications SS-C-158; SS-C-181b



360-362

360—FLOW TABLE, 30″ diameter top. For determining the consistency of Concrete, by placing a sample molded in the shape of truncated cone, on the table, and by turning the crank, the table is raised and dropped a specified distance of ½″. The "spread" of the base of the cone expressed as a percentage of its original bottom diameter is the "flow." The top is of cast bronze, mounted in a heavy cast iron frame, with the crank actuating a cam to produce the required drop. Includes a cone mold 6¾″ in diameter at the top, 10″ in diameter at the bottom and 5″ in height.

362—FLOW TABLE, 10″ diameter top. For determining the consistency of Cement Mortars, Masonry Cement, or Hydrated Lime. Arranged for both ⅛″ and ½″ drops. Supplied with heavy bronze cone mold, 2¾″ in diameter at the top, 4″ diameter at the bottom, and 2″ in height. Includes spacing collar for changing the drop of table from ½″ to ⅛″.

362-1—CALIPER, for use with No. 362 Flow Table for determining the percentage of flow in accordance with the specifications of the National Bureau of Standards.

WATER RETENTION APPARATUS

A. S. T. M. Designation C91
Federal Specifications SS-C-181b

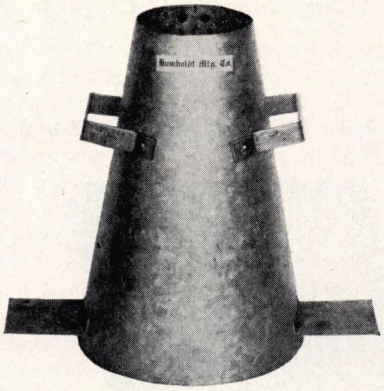
Apparatus consists of an aspirator pump controlled by a mercury column relief and connected by way of a three-way stopcock to a funnel upon which rests a perforated dish. A mercury manometer is connected, to indicate the vacuum. A rubber gasket sealed to the top of the funnel is kept wet during the test to insure a seal between funnel and dish.

The mortar shall be mixed to a consistency (flow) of from 100 to 115 per cent which is determined by means of the Flow Table described under catalog No. 362. Immediately after making the flow test, the mortar is then prepared as cited in the specifications and placed in the porcelain dish, and levelled off. The dish is then put in place on the filter funnel and a vacuum of 2″ of mercury is applied for 60 seconds. At the end of that time, the suction is stopped, the mortar removed, and its flow is measured again by means of the Flow Table.

363—WATER RETENTION APPARATUS—Complete as described, including mercury for pressure regulator and manometer, aspirator pump, rubber tubing and supports with clamps.

SLUMP CONE and PUDDLING ROD

A. S. T. M. C29; C31; C39; C87; C138; C143
A. A. S. H. O. Methods T-19; T-22; T-23
Federal Specifications SS-R-406



364

365

364—SLUMP CONE, for determining the consistency of Portland Cement concrete with aggregate less than 2″ in size. Mold is conical in shape, 8″ in diameter at the base, 4″ in diameter at the top, and 12″ high, and is fitted with handles and foot pieces.

365—PUDDLING RODS. For use with Nos. 294, 295 and 296 Concrete Cylinder Molds, No. 364 Slump Cone and No. 366 Measures. 24″ long.

UNIT WEIGHT MEASURES

A. S. T. M. C29; C138

A. A. S. H. O. Method T-19

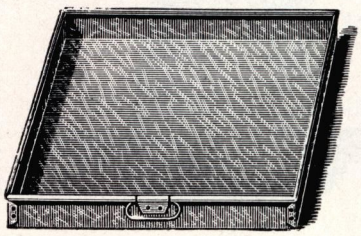
Federal Specifications SS-A-281; SS-R-406

366

366—MEASURES, made of galvanized iron with handles for Unit Weight determinations of aggregates for concrete.

Capacity, cubic ft.	1/10	1/2	1
Diameter, inside, inches	6.0	10.0	14.0
Height, inside, inches	6.1	11.0	11.23

CEMENT IMMERSION PAN



372

372—CEMENT IMMERSION PAN, for immersing cement briquettes in water. The pan is made of heavy galvanized sheet iron and measures 24 inches square by 3 inches deep.

Cement Immersion Rack to order.

RUBBER GLOVES

374

374—RUBBER GLOVES, used for mixing cement. Medium weight, short form, without gauntlets. Specify size.

375—RUBBER GLOVES, similar to No. 374, but heavy weight and with gauntlets, length overall 14 inches. Specify size.

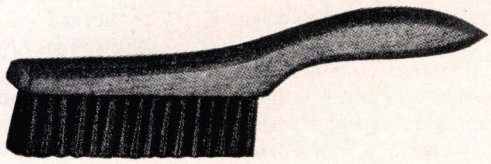
CEMENT TROWELS

376-378

376—CEMENT TROWELS, used for mixing cement batches, for filling molds, etc. The trowels are made of heavy steel, with wooden handles; the blades are flat and pointed and are 5 inches long.

378—CEMENT TROWELS, similar to No. 376, but with blades 10 inches long.

CEMENT MOLD BRUSH



380

380—CEMENT MOLD BRUSH, for cleaning metal, molds, etc. Made of wood with brass wire bristles.

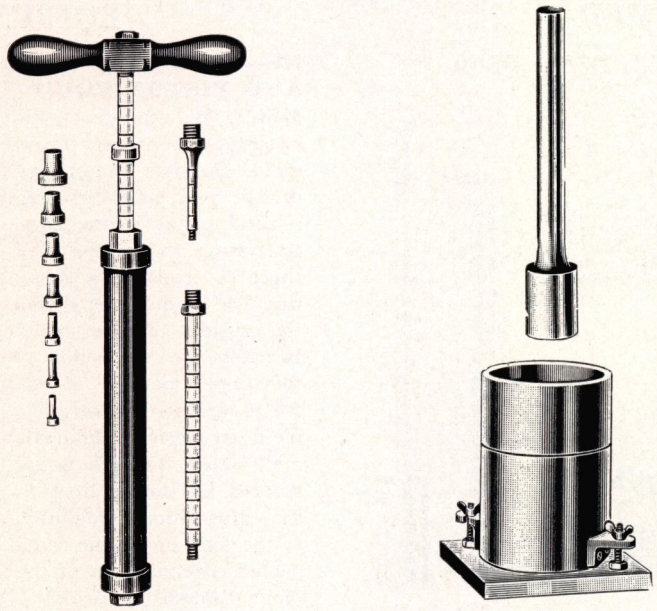
TESTING SAND

A. S. T. M. C77 A. A. S. H. O. Method T-1

Federal Specifications SS-C-158

382—SAND, Standard A. S. T. M., for cement testing. Supplied in 100 lb. bags.

PROCTOR SOIL PLASTICITY APPARATUS



700

700—SOIL PLASTICITY APPARATUS, Proctor, for the control of soil compaction on earthfills, embankments, foundations as well as earth dams. For references, see articles by **R. R. Proctor in Engineering News Record of August 31, September 7, September 21 and September 28, 1933.**

Approximately 5 pounds of dry soil passing a No. 10 sieve is mixed thoroughly with just enough water to make it slightly damp, then compacted in 3 layers, in a brass cylinder 4″ dia. and about 4½″ deep, mounted on a removable base plate and fitted with a detachable collar 2″ high to hold the loose soil in place while compacting. Each layer is given 25 blows from a 5½-pound cylindrical rammer having an end area of about 3 square inches, dropped 1 foot. The soil is then struck off level with the cylinder, weighed, and the stability determined with the plasticity needle by measuring the force required to press it into the soil at the rate of one-half inch per second. A small sample of the soil is oven dried to determine the moisture content.

The procedure is repeated, each time adding about 1 per cent more water, until the soil becomes very wet. The effect of moisture on the densities of the compacted samples is shown by plotting the densities of the compacted soil when dry, expressed in pounds per cubic foot, against moisture content. The plasticity needle readings, expressed in pounds per square inch, are also plotted against moisture content to show the effect of moisture on stability.

In the laboratory the instrument is used to prepare the moisture-plasticity curve of the soil being used. In the field the completeness of compaction may be determined very quickly by comparing the value obtained in the compaction cylinder with readings made directly on the soil in place on the job.

Apparatus consists of a compaction cylinder, 5½ lb. rammer, plasticity needle with long and short shank and seven interchangeable needle points having bearing areas of 1/20 sq. in.; 1/10 sq. in.; 1/5 sq. in.; 1/3 sq. in.; ½ sq. in.; ¾ sq. in. and 1 sq. in. The two smallest needle points are used with the short needle shank, and the others with the long needle shank. Graduations inscribed on the needle shanks at intervals of ½ inch indicate the depth of penetration, and the force applied is measured by the compression of calibrated spring inside the instrument. The plunger rod is calibrated for every 10 lbs. pressure up to a total of 110 lbs. A sliding ring indicates the maximum pressure reached.

701—MOLD AND TAMPER only.

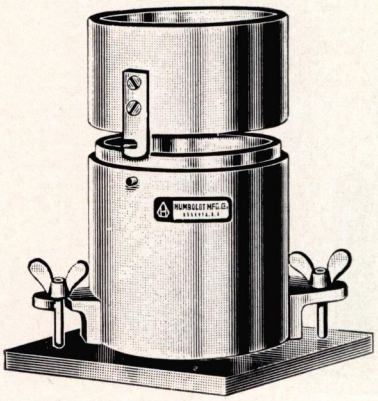
702—PENETRATION POINTS only. (Specify size).

703—CARRYING CASE for Proctor Soil Plasticity Needle.

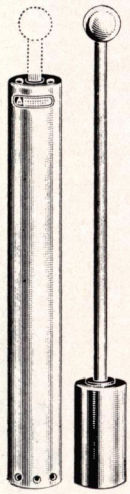
706—STRAIGHTEDGE—Steel. 12″ long.

MOISTURE-DENSITY MOLD AND RAMMER

A. S. T. M. D558; D559; D560



715



716

715—MOISTURE-DENSITY MOLD, for determining the relationship between the moisture content of soil-cement mixtures **A. S. T. M. D558;** for determining the soil-cement losses, moisture changes, and volume changes produced by repeated wetting and drying of compacted specimens, or for determining the soil-cement losses, moisture changes and volume changes produced by repeated freezing and thawing of compacted specimens.

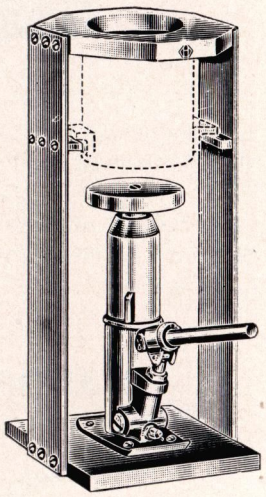
Consists of a cylindrical metal mold having a capacity of 1/30 cu. ft. with an internal diameter of 4" and a height of approximately 4.6", which has a detachable collar assembly approximately 2½" in height, to permit preparing compacted specimens of soil-cement mixtures 4" in diameter and approximately 4.6" in height which have a volume of 1/30 cu. ft. Mold and collar is fastened to a detachable base.

716—MOISTURE-DENSITY RAMMER Controlled 12" Drop, for use with No. 715 mold. Consists of tamper with 2" diameter face, weighing 5½ lbs., enclosed in a cylinder to guide its fall. A stop in the top of the enclosing cylinder controls the fall of the tamper to exactly 12" as required in the test.

718—PLUNGER AND RECEIVING CYLINDER. For removing compacted soil specimen from mold. **A. S. T. M. Specifications D558; D559 and D560.**

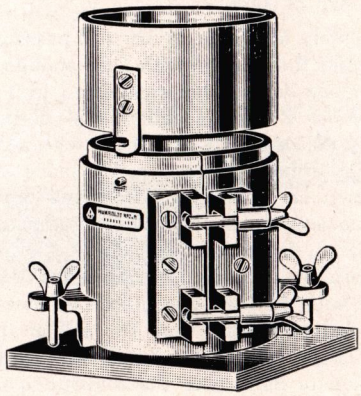
HYDRAULIC JACK AND PISTON EQUIPMENT

720—HYDRAULIC JACK AND PISTON EQUIPMENT, for removing soil-cement specimen from mold. Consists of an hydraulic jack mounted onto a rigid metal frame. Onto the piston rod of the jack there is fastened a metal disc 3⅞" in diameter fitting the inside of the mold. Brackets on the sides of the upper portion of the frame are for holding the mold in position immediately above the jack as indicated by dotted lines in the illustration. Operation of the jack forces the compacted specimen out of the mold through an opening 4¼" in diameter provided in the top of the frame.



720

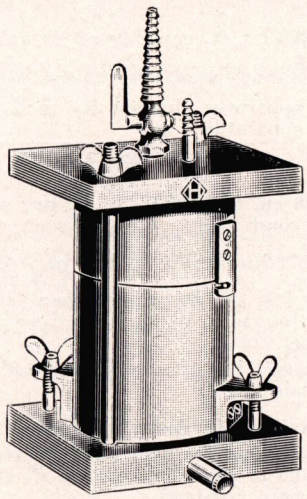
MOISTURE-DENSITY MOLD SPLIT-TYPE



725

725—MOISTURE-DENSITY MOLD, Split-Type, for field use. Like No. 715, for making compacted soil-cement specimens in accordance with **A. S. T. M. specifications D558; D559 and D560,** but with slit along one element and provided with clamps for closing. When opened mold will spring apart slightly so as to permit removal of the compacted specimen.

PERMEAMETER FOR COMPACTED SPECIMENS



710

710—SOIL PERMEAMETER, used to determine the permiability to water of soils specimens compacted by the Proctor Plasticity Method. Apparatus is furnished complete as illustrated and consists of an upper plate with valve and nipple; a two-piece cylindrical mold of the same capacity and design as the No. 700 Proctor mold; a filter base plate and filter stone.

711—SOIL PERMEAMETER ATTACHMENT only, for use with No. 700 Proctor mold. Consists of upper plate with valve and nipple; lower plate with outlet, studs **736—DISPERSION CUP** only.

712—FILTER STONE only.

SOIL TESTING HYDROMETERS AND JARS

A. S. T. M. D422 A. A. S. H. O. Method T-88

The soil sample, after dispersion in the machine described under No. 735, is transferred to a glass graduate and diluted to 1000 ml. After the suspension has been brought to a constant temperature, the hydrometer is inserted and readings are taken at stated intervals. Complete description of the method will be found in the test methods cited above.

741—SOIL TESTING HYDROMETER "A"—Graduated in grams of soil per liter at 67 F. from 0 to 60 grams in 1 gram divisions.

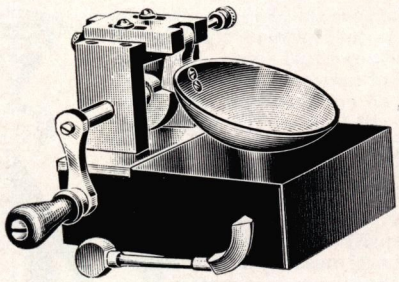
742—SOIL TESTING HYDROMETER "B"—Graduated in specific gravity at 67 F., from 1,000 to 1.050 in steps of 0.001.

743—HYDROMETER JAR—Graduated at 1130 and 1205 ml.; 18″ tall.

744—HYDROMETER JAR—Graduated at 1000 ml.; 18″ tall.

LIQUID LIMIT MACHINE

A. S. T. M. D423 A. A. S. H. O. Method T-89



730

The liquid limit of a soil is that moisture content, expressed as a percentage of the weight of the oven-dried soil, at which the soil will just begin to flow when lightly jarred ten times, at the rate of two drops per second.

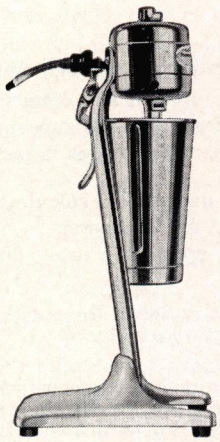
730—LIQUID LIMIT MACHINE. Consists of a brass cup, crank and cam mechanism, and carriage, mounted on a hard-rubber base. The required drop of 1 cm. of the cup is produced by means of the crank and cam. Complete with A. S. T. M. grooving tool as specified.

731—BRASS CUP only, for above.

732—GROOVING TOOL only, for above.

SOIL DISPERSION STIRRER

A. S. T. M. D422 A. A. S. H. O. Method T-88



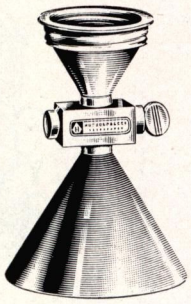
735

735—SOIL DISPERSION MIXER, Bouyoucos, for dispersing soil suspensions used in the hydrometer method of testing subgrade soils. Consists of a stirring apparatus with specified paddle and a special chrome-plated nickel dispersion cup with permanent baffle rods fastened on the inside. For 110 volts A.C. or D.C.

736—DISPERSION CUP only.

DENSITY APPARATUS

(Sand Method)



745

The purpose of the density apparatus is to facilitate the use of the sand method for checking densities of materials found in road surfaces or embankment lifts to a depth of six inches. The apparatus is designed to permit the use of available sands, reduce variations in procedure and simplify procedures.

The density apparatus consists of a two-quart mason jar and a detachable appliance consisting of a brass valve, having the small end of a standard pycnometer top brazed to one opening and the small end of a brass cone fixed in a like manner to the other opening. A stop is set at one end of the valve to control the opening and closing of the bore.

A four inch Soil Auger Cat. No. 758 should be used to remove the material sampled. Any air dry sand, preferably of round particles passing through a No. 8 sieve may be used for the testing material. After the soil or material has been removed the density apparatus is placed over the hole and the valve opened. When the sand has ceased flowing, the valve is closed and the balance of the sand in the jar is weighed for calculations. It should be noted that the flow of sand is controlled by the size of the bore which tests indicate is one of the major factors controlling the density of free falling sand.

Since sands vary in their specific gravities, gradation and behavior during settlement, it has been found necessary to calibrate each sand before making the density test.

Calibration of Density Apparatus

1. Set mason jar upright and open valve.
2. Fill jar with water until it appears in cone.
3. Close valve, pour out water in cone and dry funnel and jar.
4. Weight water and jar and calculate volume of water.
5. Empty jar and dry apparatus.
6. Repeat above operations using dry sand instead of water.

The results will indicate the weight of dry sand required to fill a certain volume.

It is also necessary to calibrate the constant weight of dry sand contained in the cone when the apparatus is inverted. To do this, invert the apparatus with the base of the cone setting on a smooth solid surface, open the valve, and allow the air dry sand to fill the cone. Close the valve, weigh the balance of the air dry sand, and calculate the constant weight of air dry sand held by the cone.

Example of Calibration Test

Weight of apparatus plus water = 7.69 lb.
Weight of apparatus = 3.45 lb.
Weight of water = 4.24 lb.

DENSITY APPARATUS Cont'd

Since one cu. ft. of water weighs 62.4 lb.
Then:

$\frac{4.24}{62.40}$ = 0.068 cu. ft., capacity of jar and pycnometer top.

Also if:

Weight of apparatus plus air dry sand = 10.23 lb.
Weight of apparatus = 3.45 lb.
Weight of air dry sand = 6.78 lb.

Therefore:

0.068 cu. ft. = 6.78 lb. air dry sand.

Density of sand:

$\frac{6.78}{0.068}$ = 99.71 lb. per cu. ft., dry weight.

Therefore, this air dry sand, when passed through the bore in the valve, will have a dry weight density of 99.71 lb. per cu. ft.

It is also found that the weight of sand contained in the cone equals 1.43 lb.

Example of Actual Density Test

After the material has been removed from the fill or roadway to the proper depth with a 4" auger, the following data were obtained.

Wet weight of material = 5.87 lb.
Oven dry weight of material = 5.04 lb.
.83 lb.

Volume Determination

In making field density tests, it is not necessary to completely fill the jar for each test.

Weight of calibrated air dry sand plus apparatus = 9.85 lb.
Weight of apparatus = 3.45 lb.
Weight of air dry sand in apparatus = 6.40 lb.
Weight of apparatus and unused sand = 3.87 lb.
Weight of sand in cone = 1.43 lb.
Total weight of unused sand and app. = 5.30 lb.
Weight of apparatus = 3.45 lb.
Total weight of unused sand = 1.85 lb.
Weight of original air dry sand to be used = 6.40 lb.
Weight of unused air dry sand = 1.85 lb.
Weight of sand occupying space of removed material = 4.55 lb.

Then the volume occupied by material removed equals:

$\frac{4.55}{99.71}$ = 0.0456 cu. ft.

And since 5.04 lb. of oven dry material were removed
Then:

$\frac{5.04}{0.0456}$ = 110.5 lb. per cu. ft., Dry weight density of material in fill or roadway.

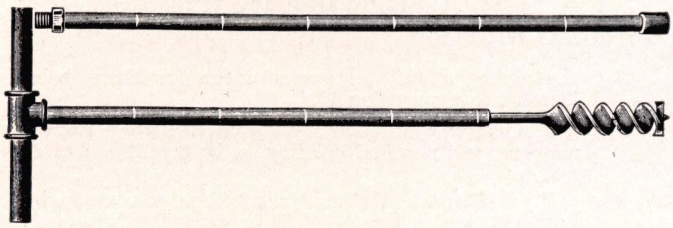
The moisture content of the removed material can also be calculated as follows:

Wet weight of material = 5.87 lb.
Oven dry weight of material = 5.04 lb.
Moisture content of material = 0.83 lb.

Per cent moisture in material = $\frac{0.83}{5.04}$ or 16.5%

745—DENSITY CONE APPARATUS. Complete with a two quart Mason jar.

SOIL AUGERS



750—751

750—SOIL AUGER, for use in sampling soils in accordance with **A. S. T. M. Specifications D-420 and A. A. S. H. O. Method T-86.** Consists of a steel stem, with graduations every 6 inches, into which an auger bit is securely fastened. The handle is removable to permit attachment of No. 751 extension for sampling beyond 36 inches below the surface. Length, 36 inches. Without extension.

751—EXTENSION, for use with No. 750 Auger to increase its length to 72 inches. Length, 36 inches, with graduations every 6 inches.

755—SOIL AUGER, Dry Soil Type. Similar to No. 750, but for use in sampling dry soils which will not cling to the screw and are held in place by means of a sleeve over the screw. Length, 24″ with graduations every 6″.

756—EXTENSION, for use with No. 755 Auger. Length, 24″ with graduations every 6″.

758—SOIL AUGER. Diameter 4″, length 48″, with T-handle.

SHRINKAGE APPARATUS

A. S. T. M. D427 A. A. S. H. O. Method T-92

760—SHRINKAGE APPARATUS, A. S. T. M. For determining the shrinkage factors of soils in accordance with the specifications. Apparatus consists of a porcelain evaporating dish 4½″ in diameter, a flat blottom porcclain dish 1¾″ in diameter by ½″ high, a glass crystallizing dish 2″ in diameter by 1″ high with top rim ground smooth and level, and a glass plate 3x3″ and $\frac{1}{16}$″ thick with three fiber prongs.

MORTAR AND PESTLE

A. S. T. M D421

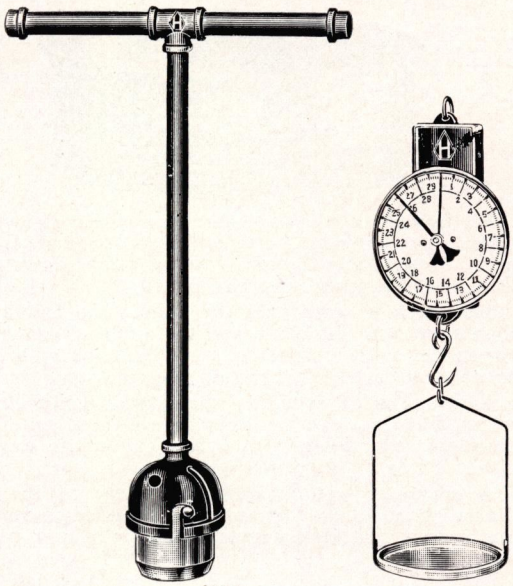
762—MORTAR & PESTLE, for crushing soil specimen. Consists of a porcelain mortar and rubber-covered wooden pestle.

WIRE SCRATCH BRUSH

A S. T. M. D559; D560

765—WIRE SCRATCH BRUSH—Made of 2″ by $\frac{1}{16}$″ flat No. 26 gage wire bristles assembled in 50 groups of 10 bristles each and mounted to form five longitudinal rows and ten transverse rows of bristles on a 7½″ by 2½″ hardwood block.

SOIL COMPACTION CONTROL KIT



766

766—SOIL COMPACTION CONTROL KIT, for determining the relation of moisture content and maximum density of soils in accordance with U. S. National Park Service design and described in the publication "Low Dams" prepared by the National Subcommittee on Small Water Storage Projects, 1938 Edition, page 297.

Outfit consists of a soil sampler, compaction cylinder with tamper, spring scale with stirrup and pan, straightedge and trowel.

The soil sampler consists of a detachable steel cylinder and a T-shaped pipe handle. The steel cylinder is provided with a sharp cutting edge and has the same volume as the compaction cylinder described under No. 715. The tamper is of the controlled drop type described under No. 716. The spring scale has a capacity of 30 pounds graduated by $\frac{1}{10}$ pound and is provided with tare pointer and stirrup with pan for holding specimens while being weighed.

767—SOIL SAMPLER only.

768—SPRING BALANCE WITH STIRRUP AND PAN only.

715—COMPACTION CYLINDER only.

716—TAMPER only, controlled 12″ drop.

FOR TESTING SIEVES, see pages 50 and 51.
FOR SAMPLE SPLITTERS, see page 52.
FOR DRYING OVENS, see page 62.
FOR SOIL SCALE AND BALANCES, see pages 56-61.

U. S. STANDARD SIEVES

A. S. T. M. Designation E11 **A. A. S. H. O. Methods T-27; T-30; T-37; T-88**

Federal Specifications RR-S-366

All frames, of seamless spun brass with rigid rolled edges, have extended bottoms (skirts) to fit all frames, pans, or separator bottoms of the same diameter, so that a set of sieves may be stacked.

The cloth is spun onto the frame, the frame skirt then spun over the cloth, and the circle of contact between the cloth and frame smoothly filled with solder so no material is lost between the cloth and frame.

Covers are of seamless spun brass, with handles which fold into the top depressions. Pan bottoms, of seamless spun brass with rolled edges, are available either 1″ or 2″ deep.

A separator bottom consists merely of the sieve frame, with skirt to fit any frame the same size, but has a solid partition which serves both as a pan for the sieves above, and as a cover for those below. Depth above partition 1″.

A nameplate on each sieve gives the Sieve number, microns, and nominal opening, in both millimeters and inches.

U. S. Bureau of Standards Sieves are stocked in both full and half height, 8″ in diameter, but can be supplied in either 10″, 12″ or other diameters, any depth, to order.

Certified U. S. Bureau of Standards Sieves

For referee tests, U. S. Bureau of Standards Sieves can be supplied with certificates showing that they have been tested by the Bureau and conform with their specifications and tolerances. Sieve Nos. 100 and 200, certified as to mesh and wire diameter, are stocked. Others will be sent to the bureau for certification upon order.

387—U. S. Bureau of Standards Sieve No. 200, with certificate of correctness as to mesh and wire diameter only. Diameter 8″; depth above cloth 2″.

388—Same as No. 387, but certificate also gives correction factor.

TABLE OF SIZES AND EQUIVALENTS

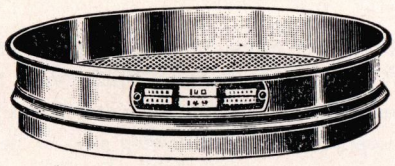
Catalog Number		Fine Series							
8″ Dia. Full Height 2″ Deep Above Cloth	8″ Dia. Half Height 1″ Deep Above Cloth	Sieve Number	A.S.T.M. Designation, Microns	Tyler Designation, Mesh	Actual Number of Openings Per Lineal Inch	Sieve Opening In.	Sieve Opening Mm.	Wire Diameter In.	Wire Diameter Mm.
392-4	391-4	4	4760	4	4.22	0.187	4.76	0.50	1.27
392-5	391-5	5	4000	5	4.98	0.157	4.00	.044	1.12
392-6	391-6	6	3360	6	5.81	0.132	3.36	.040	1.02
392-7	391-7	7	2830	7	6.80	0.111	2.83	.036	0.92
392-8	391-8	8	2380	8	7.89	.0937	2.38	.0331	0.84
392-10	391-10	10	2000	9	9.21	.0787	2.00	.0299	0.76
392-12	391-12	12	1680	10	10.72	.0661	1.68	.0272	0.69
392-14	391-14	14	1410	12	12.58	.0555	1.41	.0240	0.61
392-16	391-16	16	1190	14	14.66	.0469	1.19	.0213	0.54
392-18	391-18	18	1000	16	17.15	.0394	1.00	.0189	0.48
392-20	391-20	20	840	20	20.16	.0331	.84	.0165	0.42
392-25	391-25	25	710	24	23.47	.0280	.71	.0146	0.37
392-30	391-30	30	590	28	27.62	.0232	.59	.0130	0.33
392-35	391-35	35	500	32	32.15	.0197	.50	.0114	0.29
392-40	391-40	40	420	35	38.02	.0165	.42	.0098	0.25
392-45	391-45	45	350	42	44.44	.0138	.35	.0087	0.22
392-50	391-50	50	297	48	52.36	.0117	.297	.0074	.188
392-60	391-60	60	250	60	61.93	.0098	.250	.0064	.162
392-70	391-70	70	210	65	72.46	.0083	.210	.0055	.140
392-80	391-80	80	177	80	85.47	.0070	.177	.0047	.119
392-100	391-100	100	149	100	101.01	.0059	.149	.0040	.102
392-120	391-120	120	125	115	120.48	.0049	.125	.0034	.086
392-140	391-140	140	105	150	142.86	.0041	.105	.0029	.074
392-170	391-170	170	88	170	166.67	.0035	.088	.0025	.063
392-200	391-200	200	74	200	200.	.0029	.074	.0021	.053
392-230	391-230	230	62	250	238.10	.0024	.062	.0018	.046
392-270	391-270	270	53	270	270.26	.0021	.053	.0016	.041
392-325	391-325	325	44	325	323.	.0017	.044	.0014	.036
392-400	391-400	400	37	400	400.	.0015	.037	.001	.025

For Coarse Series Sieves See Following Page

U. S. STANDARD SIEVES Continued

Coarse Series

Catalog Number	Sieve Size	Sieve Opening In.	Sieve Opening Mm.	Wire Diameter In.	Wire Diameter Mm.	Catalog Number	Sieve Size	Sieve Opening In.	Sieve Opening Mm	Wire Diameter In.	Wire Diameter Mm.
394-3	3″	3.00	76.2	0.25	6.3	394-⅞	⅞″	.875	22.2	0.135	3.42
394-2½	2½″	2.50	63.5	0.192	4.88	394-¾	¾″	.750	19.1	0.135	3.42
394-2	2″	2.00	50.8	0.192	4.88	394-⅝	⅝″	.625	15.9	0.120	3.04
394-1½	1½″	1.50	38.1	0.177	4.50	394-½	½″	.500	12.7	0.105	2.67
394-1¼	1¼″	1.25	31.7	0.148	3.76	394-⅜	⅜″	.375	9.52	0.092	2.33
394-1	1″	1.00	25.4	0.162	4.12	394-¼	¼″	.250	6.35	0.070	1.77



391

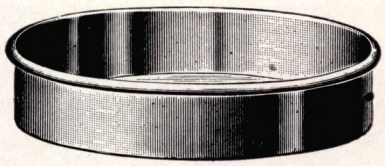
391—U. S. STANDARD SIEVES, 8″ diameter, half height, 1″ deep above cloth. For sizes and equivalents see preceding page.

394

394—U. S. STANDARD SIEVES, Coarse Series, 8″ diameter, full height, 2″ deep above cloth. For sizes see above.

392

392—U. S. STANDARD SIEVES, Fine Series, 8″ diameter, full height, 2″ deep above cloth. For sizes and equivalents see preceding page.



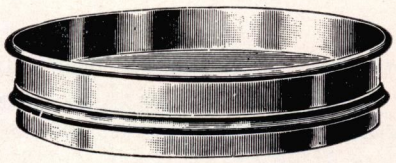
395

395—BOTTOM PAN, for sieves, 8″ diameter, 2″ deep.

396—BOTTOM PAN, for sieves, 8″ diameter, 1″ deep.

393

393—COVER, for sieves, 8″ diameter.



397

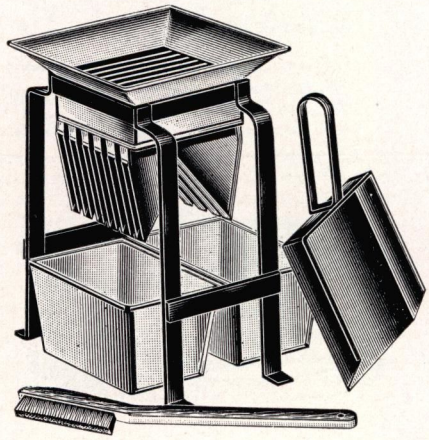
397—SEPARATOR PAN, for sieves, 8″ diameter, 1″ deep above partition.

Above Sieves, Pans or Covers 10 or 12″ diameter, to order.

RIFFLE TYPE SAMPLE SPLITTERS

A. S. T. M. C136; D421; D271; D492

A. A. S. H. O. Methods T27; T87



398

398—SAMPLE SPLITTERS. Riffle type, also known as Jones Samplers. For dividing or quartering dry materials such as cement, gravel, powdered ores, coal and coke, etc. Material poured into the hopper or riffle is divided into two equal portions by two series of chutes which discharge alternately in opposite directions into separate pans.

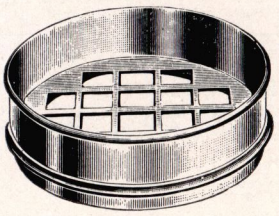
Each outfit consists of a heavy tin plate hopper supported on an iron frame; sturdy iron scoop, cleaning brush, and pans as follows: Sizes A and B each include 3 pans with bail handles and side handles; Size D includes 3 pans without handles; and sizes C and E each include 4 pans without handles.

Size No.	*A	*B	C	D	E
Size, inches	4x9	5x12½	6x6	6x11	8x10
Number of Chutes	24	20	12	18	12
Width of Chutes, In.	⅜	⅝	½	½	¾

*As specified by the American Society for Testing Materials, Serial Designation D271—"Standard Methods of Laboratory Sampling and Analysis of Coal and Coke."

STONE SIEVES

A. S. T. M. E11

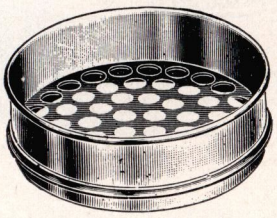


400

400—SIEVES, For Stone Testing, Square Holes. Brass frame, 8″ in diameter, 2″ deep. Similar to **U. S. Standard Sieves,** but with perforated plates instead of wire mesh. Supplied with the following sizes of sieve openings: 2″, 1½″, 1¼″, 1″, ¾″, ½″, ⅜″ and ¼″.

STONE SCREENS

A. S. T. M. E11

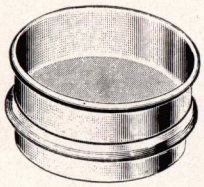


402

402—SCREENS, For Stone Testing, Round Holes. Brass frame, 8″ in diameter, 2″ deep. Screens are made in accordance with **A. S. T. M. Specifications E11.** Supplied with the following sizes of screen openings: 2½″, 2″, 1½″, 1¼″, 1″, ¾″, ½″ and ¼″.

Covers and bottoms for Nos. 400 and 402 are the same as for U. S. Standard Sieves. See page 51.

325 MESH U. S. STANDARD SIEVES



411-412

This 325 mesh sieve, 3″ in diameter, is used for determining the quantity of coarse particles in paint pigments, according to **A. S. T. M. Methods D79, D80, D81, D82, D83, D84, D185 and D186.** Because of its light weight this sieve may be weighed with its contents on an analytical balance. Depth above cloth, 1″.

409—Sieve only, with Bureau of Standards Certificate of Approval.

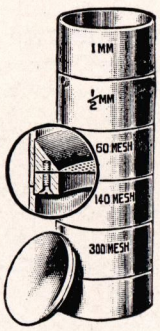
411—As above, but without Certificate.

412—Pan bottom only, 1″ deep.

413—Sieve Cover only.

Sieves 3″ in diameter of any size mesh are available to order.

MECHANICAL SOIL ANALYSIS SET

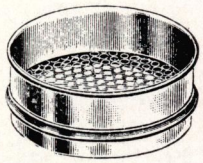


416

416—SOIL SIEVE SET, U. S. Bureau of Soils. For mechanical analysis of soils in accordance with method of the **U. S. Department of Agriculture Tech. Bulletin No. 170.** Frames are brass, carefully machined, with discs held in place by removable rings to permit replacements of worn mesh. Set consists of five sieves with bottom pan and cover. The two coarser screens have round holes of 1 and 0.5 mm. respectively. The next two sieves conform to Bureau of Standards specifications for 60 and 140 mesh. The finest sieve is 300 mesh and holds particles larger than silt size.

SOIL ANALYSIS SCREENS

Round Hole—Metric Sizes

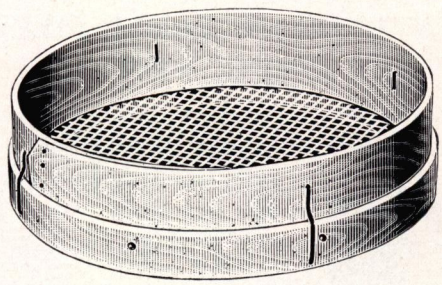


417-418

417—SOIL SCREENS, Brass Frame, 5 inch. For soil analysis in accordance with methods of the various State and Federal Agricultural Departments and Universities. Hole sizes are in metric units and all holes are equally spaced. The screening surfaces are heavy perforated brass discs spun into seamless brass frames with rolled edges and extended skirts for nesting. Diameter, 5 inches; depth 1½ inches. Furnished with the following diameter holes: 0.5, 1, 2, 3 and 5 mm. and includes pan and cover.

418—SOIL SCREENS, Brass Frame, 8 inch. Similar to No. 417 except 8 inches in diameter and 2 inches deep. Furnished with the following diameter holes: 0.5, 1, 2, 3 and 5 mm. and includes pan and cover.

WOOD RIM RIDDLES

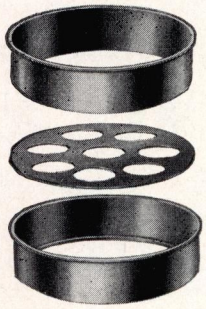


414

414—RIDDLES, Wood Frame, 18″ Diameter for making sieve analysis of coarse aggregates for concrete or other materials. These riddles are recognized by users as representing the ultimate in riddle construction. Rims are made of the best woods available and bottoms are made from galvanized steel with clear openings as follows: No. 4, ⅜″, ¾″, 1″, 1½″, 2″ and 3″.

Other size openings to order.

INTERCHANGEABLE FIELD TESTING SIEVES AND SCREENS

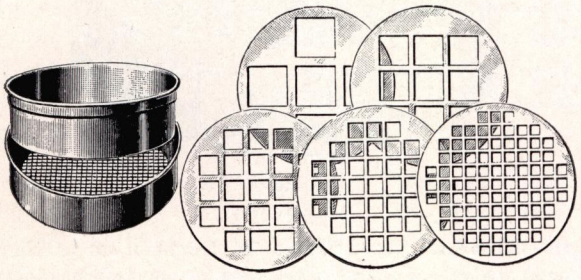


404

404—SCREENS Interchangeable, recommended for Field Testing, Round Holes. A single screen frame is used for all screen plates. This frame is composed of two circular brass rims, one fitting snugly within the other. The outer rim has a diameter of 8 inches and carries a narrow shoulder around the inside of the lower edge. The screen plates are circular brass discs, with punched circular openings, which fit inside the outer rim and are clamped against the shoulder by means of the inner rim. Set consists of one frame and seven discs with ¼", ½", ¾", 1", 1½", 2" and 2½" circular openings.

Other size openings to order.

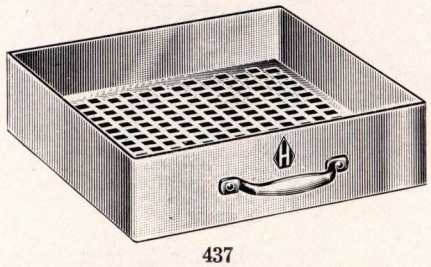
INTERCHANGEABLE FIELD TESTING SIEVES



408

408—SIEVES, Interchangeable, Square Holes. Similar to No. 404. Set consists of a double brass frame, 8" in diameter and six plates with punched square openings 1½", 1", ¾", ½", ⅜" and a No. 4 wire mesh disc.

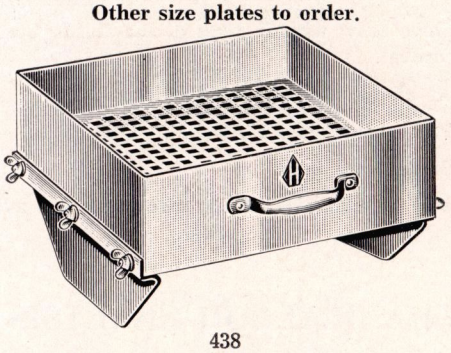
FIELD TESTING SIEVES Cont'd



437

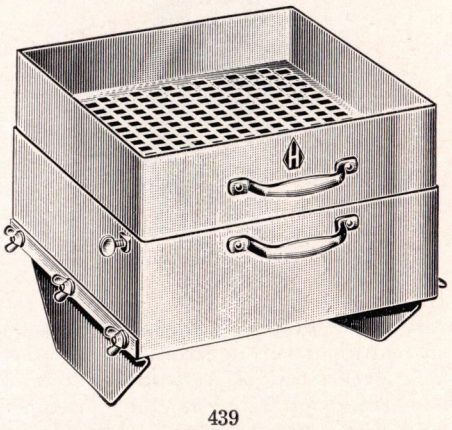
437—FIELD TESTING SIEVES, Interchangeable, Square Openings, for making sieve analysis of coarse aggregates of concrete or other materials. Consists of a single 12" square frame with handles and seven screen plates with punched square openings 3", 2", 1½", 1", ¾", ½", ⅜" and a No. 4 wire mesh screen.

Other size plates to order.



438

438—FIELD TESTING SIEVES. Like No. 437, but equipped with rockers as illustrated.

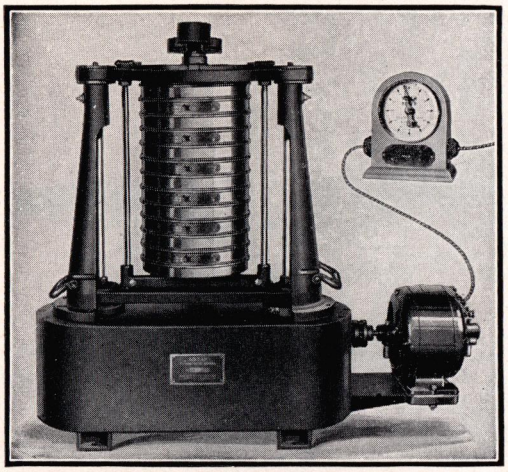


439

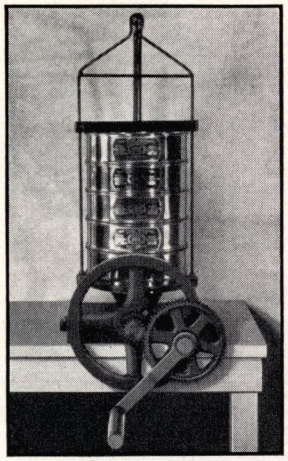
439—FIELD TESTING SIEVES. Like No. 437, but mounted on a collector box equipped with rockers. Material passing the sieve is retained in the collector box.

Above sieves with round opening plates or square wire mesh screens to order.

SIEVE SHAKERS



427



431

427—SIEVE SHAKER, Ro-Tap. For handling 8 in. diameter testing sieves. Reproduces the circular and tapping motion given testing sieves in hand-sieving, but with a uniform mechanical action. With the full-height sieves, one sample can be tested on a series of six sieves of different openings, while with half-height sieves, one sample can be analyzed on a series of thirteen sieves of different openings. By using pans with extended rims, catalog No. 397, three different samples can be tested at one shaking with full-height sieves, and seven different samples with half-height sieves.

The shaker is supplied with a ¼ H.P. electric motor for operation on 115 volt, 60 cycles A.C. Speed, 1750 R.P.M. Running parts operate in oil and shaker is installed easily as no foundation is required. An automatic electric timer can be supplied to insure making tests of comparable time periods.

Dimensions: Height, 32 in.; width, 34 in.; depth, 17 in. The net weight including motor is 290 pounds. Approximate shipping weight, 390 pounds.

Furnished without sieves and without timer.

For sieves, see pages 36 and 37.

428—SIEVE SHAKER, Ro-Tap. Same as No. 427, but for operation on 230 volt, 60-cycle A.C.

429—AUTOMATIC ELECTRIC TIMER. For use with Nos. 427 and 432 shakers. Stops shakers automatically after elapse of time set for test.

431—SIEVE SHAKER, Portable, Hand-Operated. As the name implies, this shaker is designed for easy transportation from one place to another for making field tests. It has a capacity of five full-height or ten half-height sieves with pan and cover. The sieves are actuated by a specially designed mechanism to provide the correct shaking action. By simply turning the crank at a steady speed the operator can produce the rapid, positive sieving action that assures consistent results. The shaker is ruggedly constructed and is light enough for easy handling.

Typical applications of the Portable Sieve Shaker are tests on aggregates for concrete in road construction work, ready-mixed plants, plant mix bituminous jobs, road and soil stabilization work and small aggregate producing plants having a limited number of tests to make.

Furnished without sieves. Shipping weight, 50 lbs.

432—SIEVE SHAKER, Portable, Motor-Driven. Same as No. 431, but provided with motor for operation on 115 volt, 60 cycle A.C.

433—SIEVE SHAKER, Portable, Motor-Driven. Same as No. 432, but with motor for operation on 230 volt, 60 cycle A.C.

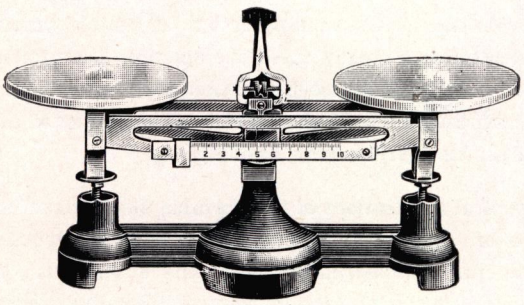
SPRING SCALES

448

448—SPRING SCALE. Recommended for field tests in the mechanical analysis of aggregates. The scale is provided with a loose pointer, which by means of a thumb screw may be set anywhere on the dial to offset the weight of the container in which aggregates are to be weighed and so the weight of the container does not have to be deducted from the reading. Capacity 60 pounds by 1/10 lb.

449—SPRING SCALE. Capacity 150 pounds by ¼ lb. Otherwise as described under No. 448.

HARVARD TRIP SCALES



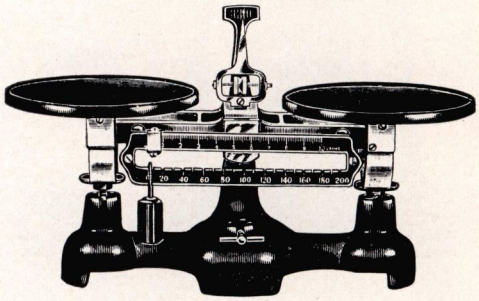
452

452—BALANCE, Harvard Trip. This balance is the most popular model for general laboratory and field work. Equipped with agate bearings and hardened steel knife edges. The scale plates are 6″ in diameter and are white enameled steel, acid and alkali-proof and unbreakable. The side beam is graduated 0 to 10 grams in 1/10 gram divisions. All metal parts have rust-proof finish and base is finished with glossy black enamel which is easily kept clean. Capacity 5000 grams. Sensibility 1/10 gram, with 2000 gram load, ½ gram with 5000 grams. No loose weights included.

For WEIGHTS, see page 61.

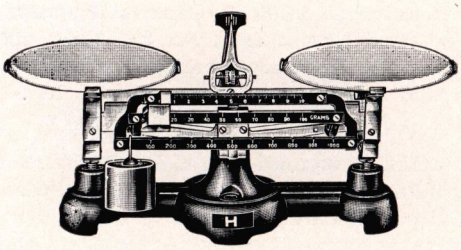
HARVARD TRIP SCALES, Cont'd

454—BALANCE, Harvard Trip. Like No. 452, but with Scoop and Counterpoise.



456

456—BALANCE, Double Beam Trip. Capacity 5000 grams. Weighs up to 210 grams without the use of loose weights. The upper beam is graduated 0 to 10 grams in 1/10 gram divisions; the lower beam is graduated to 200 grams in 10 gram divisions. Otherwise as described under No. 452.

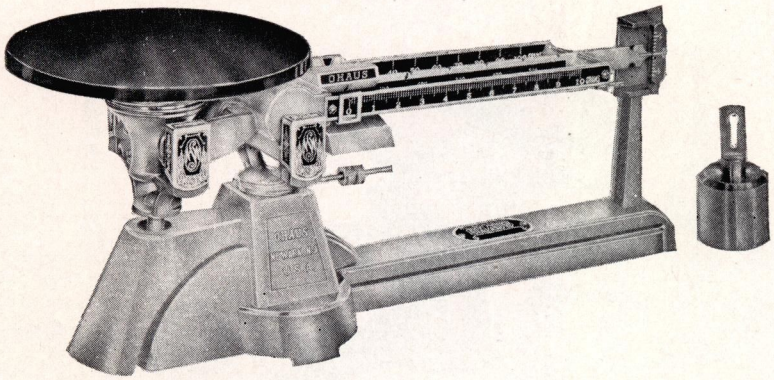


457

457—BALANCE, Triple Beam Trip. Capacity 5000 grams. With three beams and riders for weighing up to 1110 grams without loose weights. Upper beam graduated 0 to 10 grams in 1/10 gram divisions; middle beam 0 to 100 grams in 10 gram divisions, and lower beam 0 to 1000 grams in 100 gram divisions. Otherwise as described under No. 452.

458—SCOOP AND COUNTERPOISE only, for use with Nos. 452, 456 and 457 Balances.

TRIPLE BEAM SCALES



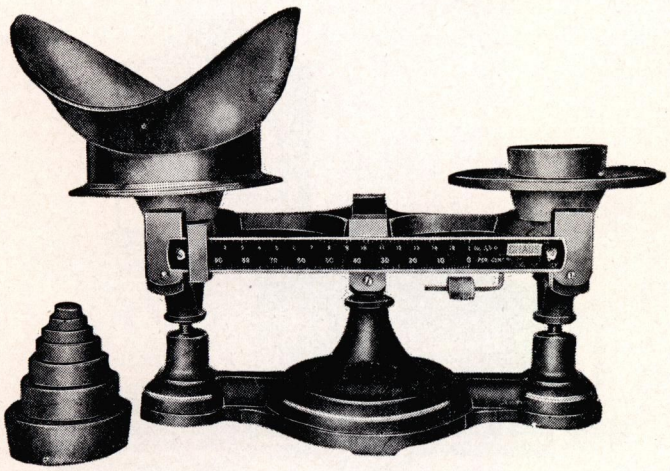
460-461

460—BALANCE, Triple Beam. Capacity 2610 grams, sensitivity 1/10 gram. Supplied with patented scale plate of Bakelite. All bearings are of highly polished genuine agate mounted in patented rust-proof alloy housings. Bearings are provided with hardened steel friction thrust plates to reduce friction to a minimum and are patented self aligning giving continuous contact to knife edges. In addition all bearings are shielded and protected with close fitting self locking dust-proof covers. The beam capacity without the attachment weights is 610 grams. The front beam weighs 10 grams by 1/10 gram; the center beam 500 grams by 100 grams and the back beam 100 grams by 10 grams. Two 1000 gram and one 500 gram attachment weights make up the total capacity of 2610 grams.

460X—BALANCE, TRIPLE BEAM. Like No. 460, but furnished with one attachment weight to have a total capacity of 1610 grams. Sensitivity 1/10 gram.

461—BALANCE, Triple Beam. Like No. 460 but furnished without the attachment weights. Capacity 610 grams, sensitivity less than 1/10 gram.

PERCENTAGE SCALE

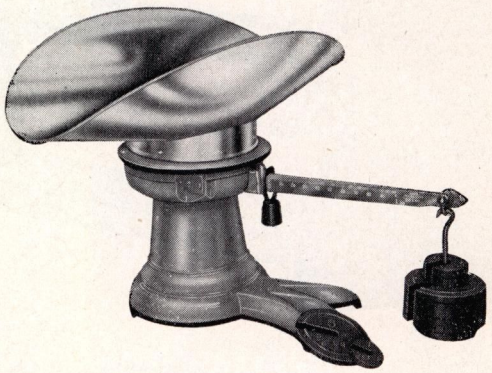


465

465—MOISTURE PERCENTAGE SCALE. This scale is used to quickly ascertain the amount of moisture in sand, ores, etc. A 16 oz. sample is weighed out, dried and re-weighed, and the correct percentage of moisture is given directly by the per cent graduations on the beam. No calculations are necessary. Upper edge of beam is divided 16 oz. x 1/4 oz. and lower beam 0 to 100%. Scale is useful for many purposes in ordinary weighing up to 4 lbs.

Scale is equipped with two 6" iron plates and provided with tin scoop and set of iron weights 2 lbs. to 1/2 oz. Capacity, 4 lbs., sensitivity 1/16 oz. Shipping weight, 40 lbs.

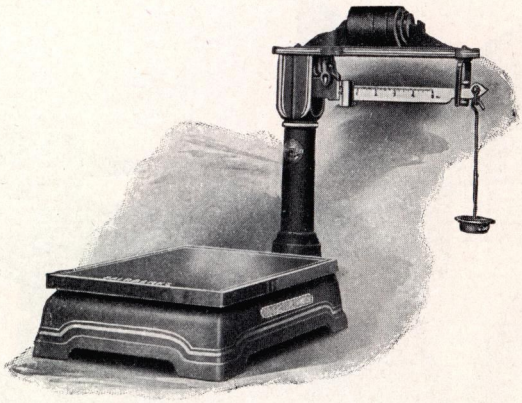
AGGREGATE AND SOIL SCALES



467

467—AGGREGATE AND SOIL SCALE. Capacity 36 pounds. This scale has been designed for extremely accurate weighing, such as making concrete aggregate tests, soil-cement tests **ASTM D558, D559 and D560** and for other fine weighing. Scale is furnished with scoop setting on a round iron plate 8½ in. in diameter. The beam is graduated 1 pound in 0.01 lb. divisions. Loose iron weights make up the full capacity.

PLATFORM SCALES

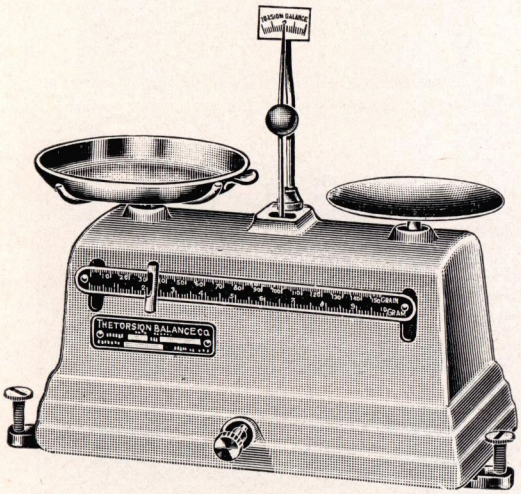


474

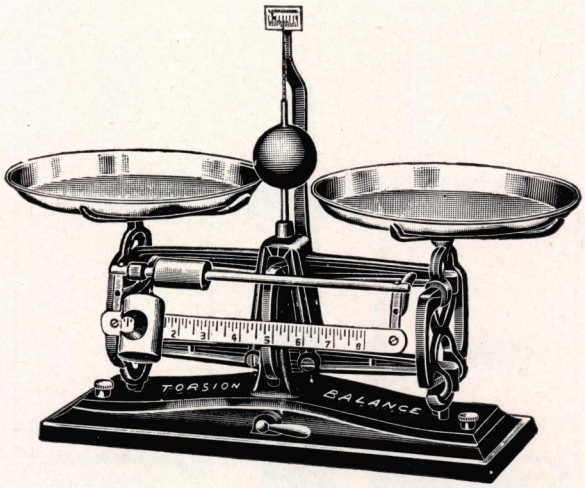
474—PLATFORM SCALE, with short pillar. Capacity 200 pounds, with beam graduated 5 lbs. by 1 ounce. This scale is an efficient compact outfit of high capacity suitable for accurate weighing and is recommended for use in **Unit Weight Determinations of Aggregates.** Scale is of metal throughout with a short iron pillar and an iron platform 10½" by 14". The arrow-tip brass beam has a smooth top and is fitted with a sliding brass poise. Loose iron weights, which make up the full capacity of the scale, are easily kept together by means of a support at the top of the pillar shelf. Overall height, 18½".

475—PLATFORM SCALE. Like No. 474, but with beam graduated 5 lbs. by 0.1 lb.

TORSION BALANCES



476



477-1

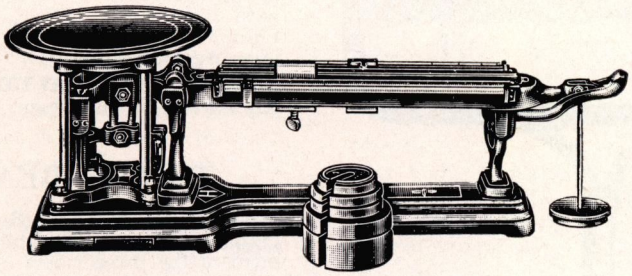
476—TORSION BALANCE, Metric. Capacity 500 grams, sensitivity 15 mg. with beam 2 grams by 1/50 gram. A precise balance with the movement enclosed in a white glazed iron case. The left pan is removable, made of stainless steel, 5″ in diameter. Length 12⅛″; width 6⅜″; total height 10½″.

476-1—TORSION BALANCE, Metric. Like No. 476, but beam having double graduations. Lower edge of beam is graduated 0 to 10 grams by 1/10 gram and the upper edge 0 to 150 grains by 1 grain.

477-1—TORSION BALANCE, Metric. Capacity 2 kg. sensitivity ⅛ gram with sliding tare weight for taring containers and beam graduated 100 grams by 1 gram. Pans are nickel plated brass, 6″ in diameter and are removable. Length 20½″; width 9½″; height 15½″.

477-2—TORSION BALANCE, Metric. Like No. 477-1, but capacity 4½ kg. sensitivity ¼ gram and is furnished with 9″ diameter nickel plated brass pans.

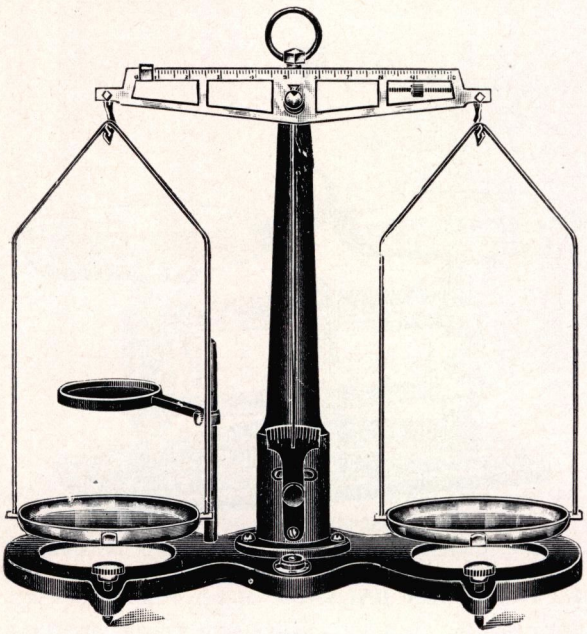
SOLUTION BALANCE



478

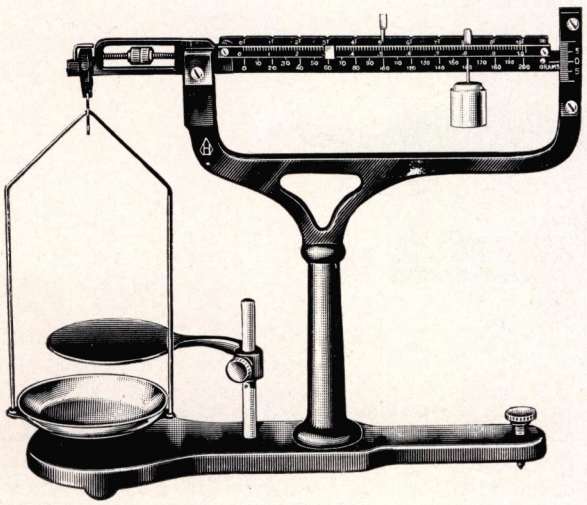
478—SOLUTION BALANCE, Metric. Capacity 20 kg., sensitivity 1 gram. This balance is of heavy construction, quite sensitive for its capacity and is equipped with a cast-iron platform 11″ in diameter. Containers can be counterpoised by means of a tare weight which slides on the middle beam. The front beam is graduated 100 grams by 1 gram divisions and the notched rear beam is graduated to 1000 grams by 100 gram divisions. Separate iron weights from 10 kilos to 1 kilo are provided. Total length 33″; shipping weight 110 lbs.

LABORATORY BALANCES



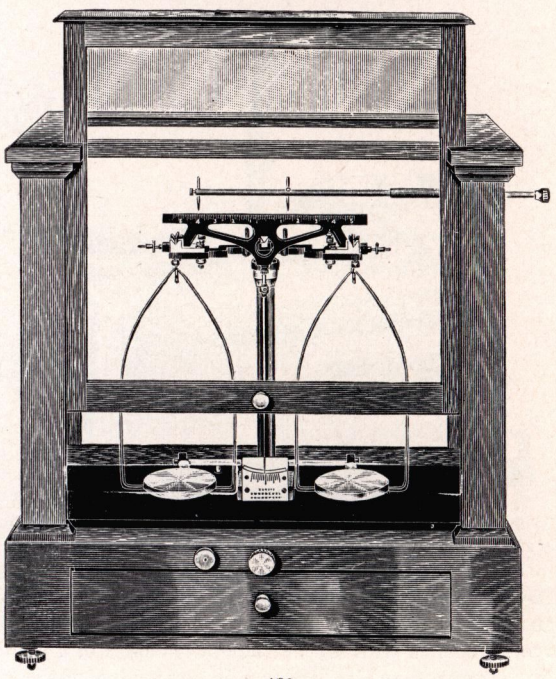
479

479—BALANCE, Laboratory. The base and pillar are of iron. The pans are 5½ inches in diameter, nickel plated. Beam is of brass, nickel plated, graduated, and carries a rider which will weigh from 1/10 to 10 grams, no small weights being necessary. Positive damping device brings balance to rest quickly. Furnished with adjustable shelf for specific gravity work, level and leveling screws for leveling the balance. Capacity, 2000 grams. Sensibility 1/10 gram.



482

ANALYTICAL BALANCE



480

480—BALANCE ANALYTICAL, recommended for use in Specific Gravity Determinations and other tests of Bituminous Road Materials. This is a carefully made and serviceable balance, of sturdy construction and has also been adapted for use in educational laboratories, and especially in industrial laboratories where a low priced dependable balance is required. **Capacity:** 200 grams. **Sensibility:** 1/10 milligram under full load. **Case:** Polished mahogany with drawer and sliding counterpoised front door and glass sides, top and back, and black glass plate inside. Size, 16½″ wide, 10″ deep, 18″ high. Leveling screws and plumb-bob are provided.

Beam: Aluminum alloy, 175 cm. long, black, lacquered, with divisions in white, graduated in 50 divisions. Equipped with Rider Carrier. **Knife Edge and Bearings:** Agate.

481—BALANCE, ANALYTICAL, same as No. 480, without drawer on slate base.

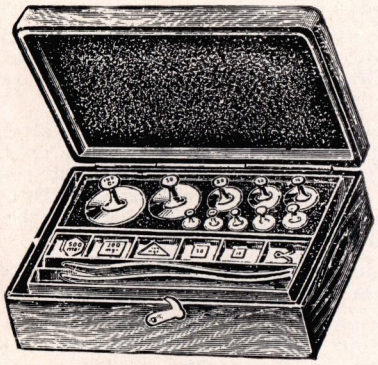
TRIPLE BEAM BALANCE

482—BALANCE, Triple Beam. This balance has three graduated beams. Weighings are obtained by movement of the three riders along the beams. An adjustable support is provided for experiments in specific gravity. Provided with stable base neatly japanned, and with sensitive spirit level and leveling screw.

Capacity of middle beam. 200 grams by 10 gram divisions; back beam 10 grams by 1 gram divisions; front beam 100 centigrams by 1 centigram divisions.

Total capacity, 211 grams, sensibility, guaranteed to 1 centigram. Accuracy, about 5 mg. Diameter of pan, 9.5 cm.; width of bow, 9.8 cm.; height of bow, 20 cm.

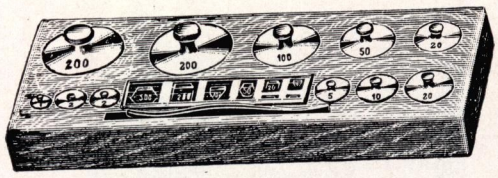
BALANCE WEIGHTS



483

483—WEIGHTS, METRIC, Medium Grade. Especially suited for student use in elementary analyses and for use in industrial laboratories where great accuracy is not necessary but requiring more precise weighing than is possible with technical weights. The gram pieces are low form, flat shaped, made of brass, highly polished. The fractionals are nickel silver of different shapes, so that the weights are easily distinguished. The set is contained in a mahogany finished box, velvet lined, with fractionals under glass. Supplied with brass forceps.

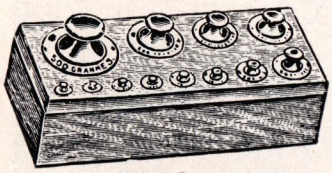
Size No.	A	B	C	D	E	F
Sets from 1 mg. to grams	20	50	100	200	500	1000



484

484—WEIGHTS, METRIC, Medium Grade. These sets are exactly the same as No. 483 but are contained in a block without cover. The fractionals are under a glass plate. Supplied with forceps.

Size No.	A	B	C	D	F	G
Sets from 1 mg. to grams	20	50	100	200	500	1000

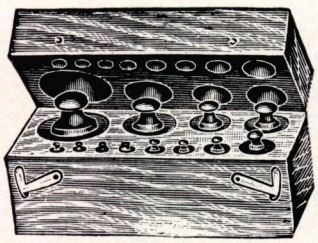


487

487—WEIGHTS, METRIC, BRASS. High Form. These are the most generally used weights in industrial laboratories for all bulk weighings, requiring greater accuracy than is possible with rough iron weights such as making solutions, experimental batches, etc. In educational laboratories of all kinds they are indispensable for student use or in the stock room for dispensing chemicals. Wherever it is necessary to weigh with a fair degree of accuracy these weights are recommended.

The gram weights are polished brass. The fractional weighs in sets from 100 gram down are nickel silver and aluminum, and are contained in a receptacle in the block. Supplied in a neatly made hardwood block, natural finish.

Size No.	A	B	C	D	E	F	G
Sets from 1 centigram to grams	20	50	100	—	—	—	—
Sets from 1 gram to grams	—	—	—	200	500	1000	2000



488

490

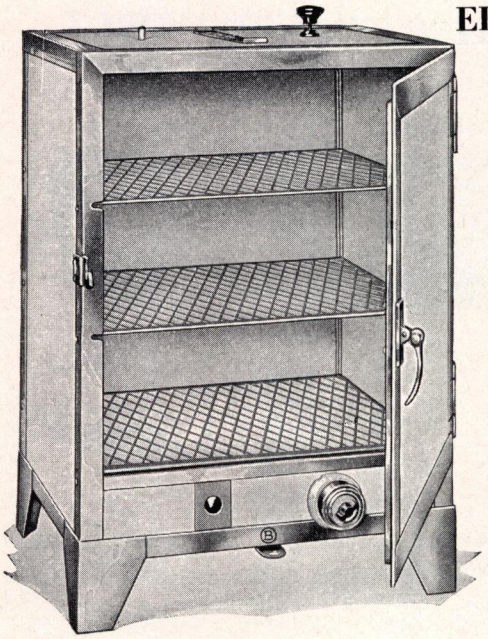
488—WEIGHTS, METRIC, BRASS. High Form. These are the same weights as No. 487 but contained in a hardwood box, with hinged cover.

Size No.	A	B	C	D	E	F	G
Sets from 1 centigram to grams	20	50	100	—	—	—	—
Sets from 1 gram to grams	—	—	—	200	500	1000	2000

490—WEIGHTS, METRIC, IRON. For coarse weighing. The weights are cast iron, finished in black baked enamel with the exception of the 5 gram weight, which is brass. They are hexagonal in shape, successively smaller so that they may be stacked.

Size No.	A	B	C	D
Sets from 5 grams to kilos	1	2	5	10

ELECTRIC OVENS



1430

1430—CONSTANT TEMPERATURE OVEN, with Bimetallic Thermostat and Switch. Temperature range from room to 180 deg. C. Inside dimensions 17x14x18 in. high. Draft is controlled by adjustable ventilators at top and bottom.

Oven is made of ⅜ in. thick new type asbestos with a substantial frame of polished stainless steel, welded together. The door is a set-in type with refrigerator style lock, and handle that remains cool. Three nickel-plated flat wire shelves are supplied and the oven so constructed that they will slide out.

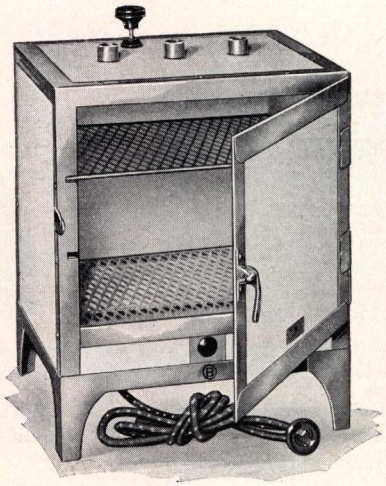
Heating units located in the bottom are removable for replacement or changing to 110 volts or 220 volts.

The thermostat and selector switch control the currents to about ± 1° C. but the temperature variation as shown by the thermometer is slightly more due to the latent heat in the coils. A pilot light is included in the equipment.

1500 watts are consumed on high heat and a ½ in. outlet box is provided for connection to a line of this capacity.

For operation on 110 volt A. C.

1432—Same, but for operation on 220 volt A. C.



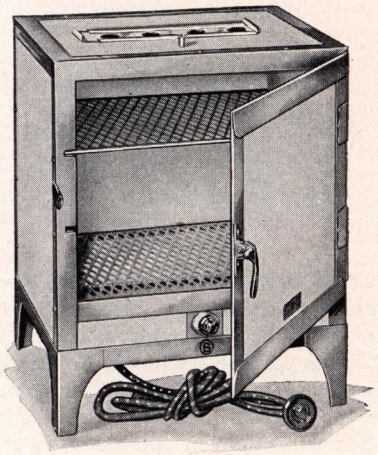
1435

1435—CONSTANT TEMPERATURE OVEN, with Bimetallic Thermostat. Temperature range from room to 180 deg. C. Inside dimensions, 12x10x10 in. high.

The construction is similar to the No. 1430 but the walls are of ¼ in. asbestos lumber. Three tubulature ventilators are provided in the top. Two shelves are regularly supplied but there are three shelf positions. In this oven only 660 watts are used, therefore attachment may be made to any ordinary lamp socket. Pilot light and six foot cord and plug furnished.

For operation on 110 volt A. C. or D. C. circuits.

1436—Same, but for operation on 220 volt A. C. or D. C. circuits.



1438

1438—ELECTRIC OVEN, with Three-Heat Switch. Temperature range 75, 110 or 155 deg. C. Inside dimensions 12x10x10 in. high.

This oven is the same as No. 1435 but for operating at temperatures approximately 75, 110 or 155 deg. C. These are the temperatures obtained by the low, medium and high positions of the switch, respectively, but some regulation can be made by adjusting the ventilator. 550 watts are consumed on high heat. Cord and plug furnished for attachment to any ordinary lamp socket.

For operation on 110 volt A. C. or D. C. circuits.

1439—Same, but for operation on 220 volt A. C. or D. C. circuits.